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CEB *Focus*

Department of Chemical Engineering and Biotechnology

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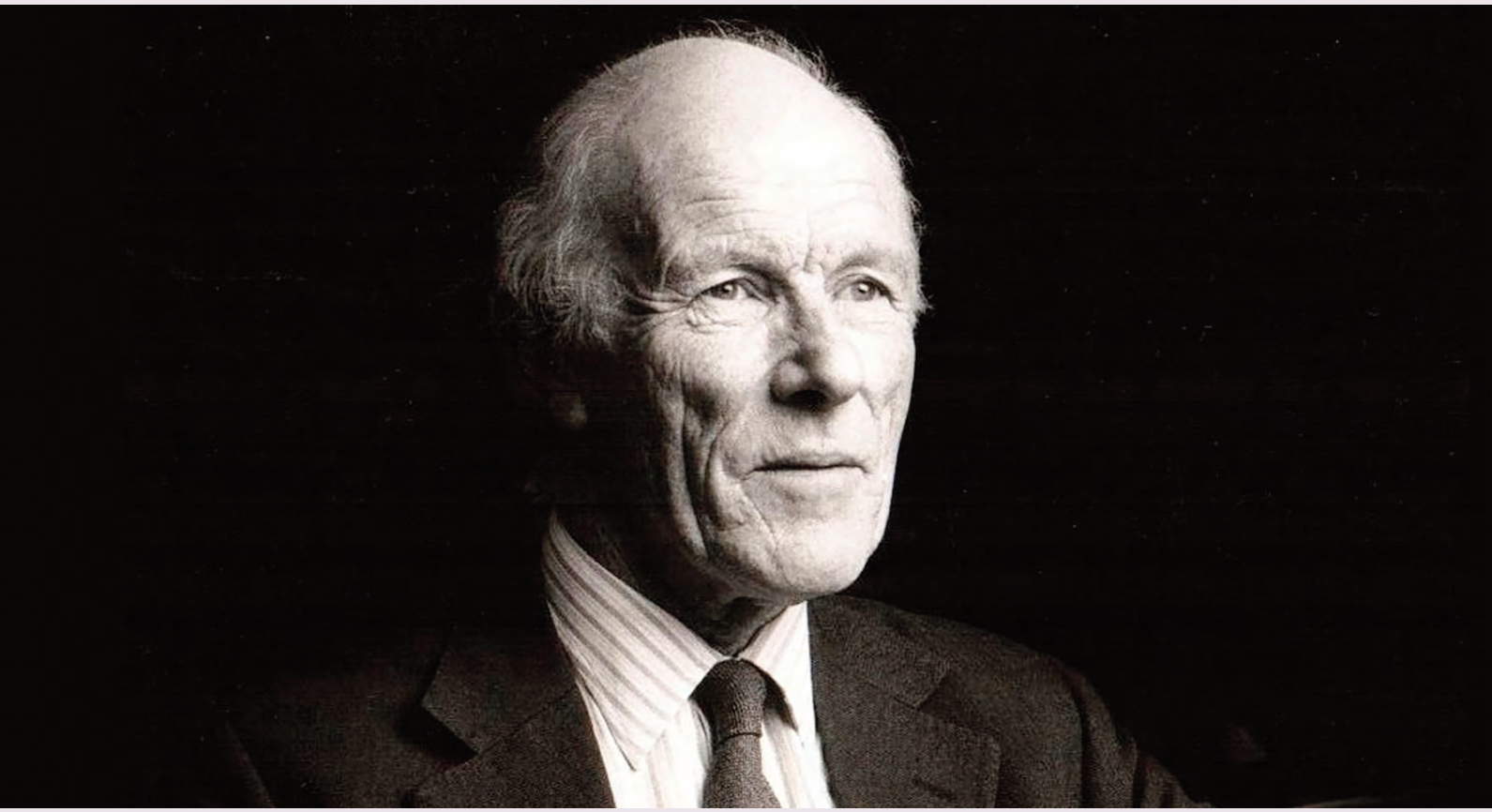
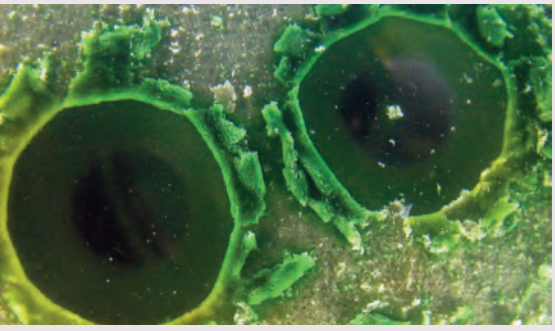


Professor John Davidson: 63 Years in Chemical Engineering *p.3*



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Dr Ljiljana Fruk

JustMilk spin-out wins Pitch @ Palace *p.19*

CEB Public Engagement Success at the Science Festival *p.22*

In this Issue

Welcome

Message from HoD, Professor John Dennis

The period since the last issue of *CEB Focus* has included two important events. The first was the celebration of Professor John Davidson's 90th birthday on 7 February, and the subsequent seminar and dinner attended by many respected alumni and acquaintances. The proceedings were further distinguished by the award by the Institution of Chemical Engineers to John of the Bird, Stewart and Lightfoot Medal for Exceptional Research in Transport Phenomena. The medal is awarded to researchers who have made outstanding contributions in the field. In awarding the prize, the judges commented on John's pioneering work in fluidisation and mass transfer and his outstanding contributions over many years to problems including heat and mass transfer and fluid and particle flows. John, of course, has made an immeasurable impact on the profession and on many alumni of this Department. In particular, he has always been a very strong advocate of academic careers that involve, at all levels, a strong intermixing of teaching and research and most of his research papers attest to the importance of thoroughly understanding the fundamentals underpinning a research problem.

The second event was to mark the retirement of Professor Howard Chase in December 2015. Howard has had a very distinguished career at Cambridge, as a researcher, a teacher, an effective Head of Department and a wise Head of the School of Technology. Like John, his academic career involved a strong link between teaching and research and his discoveries in, for example, expanded bed chromatography and bioseparations have had enormous impact in the biotechnology-base industries. I am sorry to see his Departure but I am reassured that he will keep in contact with CEB.

The new building continues to suffer delays, with the concomitant uncertainty about possible move dates. It is likely that we shall move towards the end of 2016, but the contractual situation is difficult at the current time.

Editorial Note

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

The Editorial Team wishes its readers a great summer. *CEB Focus* Newsletter is the product of a joint team effort led by Elena Gonzalez assisted by volunteer editors. Two new members have joined the Team recently: Pawat Silawattakun, CUCES new Publicity and IT Officer and CEB Postdoc Dr Parminger Heer. We would like to send member Noha Al-Otaibi our best wishes for a happy maternity leave. We are always on the lookout for new keen volunteers so, if you are interested in science and/or communication and would like to join the newsletter project team, email us on ceb-focus@ceb.cam.ac.uk. Each member is fully committed to the publication content quality and its timely delivery, helping deliver a publication with interesting content and improved overall look. They make content suggestions and contributing their own valuable input.

In this issue we are delighted to announce the launch of a new vibrant and diverse regular column *'Biotech Matters'* by Dr Ljiljana Fruk with 'Bio events that shaped the world'. The main article focuses on Professor John Davidson's Symposium that celebrated his 63 years in Chemical Engineering, his contribution to the discipline and his many achievements.

Undergraduate Focus features a message by the new CUCES Committee recently appointed, also reviewing past events like the Frank Morton Games in Manchester and the annual CUCES dinner and featuring Part IIB research project poster presentation winners. *Graduate Hub* presents the research projects by the Sensors and Applications CDT students.

Dr David Scott shares valuable insights into teaching in *Teaching Matters* as his last term in office prior to retirement comes to a close. *Research Highlights* features Dr Gabi Kaminski-Schierle breakthrough paper on transmission of amyloid species between cells accepted in PNAS. Also featured in this section is Dr Alessio Zaconne's new method to quantify the binding energy of associating polymers with neutron scattering. The *Research Feature* returns with an article on the key activities of the Sustainable Reaction Engineering Group led by Professor Alexei Lapkin.

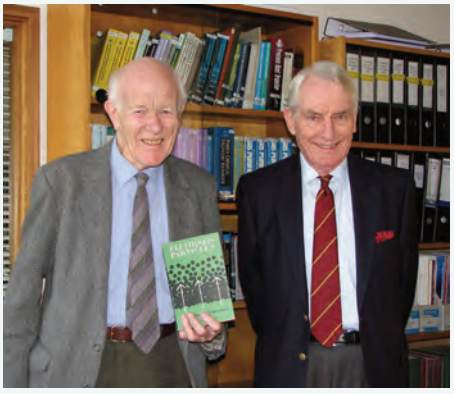
CEB Innovation welcomes back 'retired' Professor Malcolm Mackley on 'Inventing Stuff takes Time' following his 1994 joint invention with lecturer Dr Bart Hallmark. *Industry Business* offers an overview of the latest exciting industry collaborations and developments and it features PsyOmics, a new start-up launched by Professor Sabine Bahn, and Avvinity Therapeutics, a new acquisition by bio alumnus and serial entrepreneur Dr Darrin Disley.

The *Achievements* section is 'packed' again and includes Professor Bahn's recent publication in Molecular Psychiatry, the new IChemE Bird, Stewart & Lightfoot Medal award to Professor Davidson and JustMilk Ltd's win at Pitch@Palace among others.

Alumni Corner presents graduate profiles and news from Dr Sridhar Iyengar and Akshay Deshmukh. Department Events reviews a story of public engagement success with CEB's contribution to the annual University- wide Science Festival. *People Focus* presents graduates father and son Peter and Stephen Gerrard on 'ChemEng running in the family'. *CEB Women* features Elena Gonzalez, PA to HoD and Marketing Assistant and *Staff Room* presents Dr Linda Allan, the latest addition to the CEB's pool of postdoc mentors Finally, we'd like to take this opportunity to thank all contributors Webmaster Vanessa Blake for regularly providing photos, as well as departmental members, alumni and corporate partners for sending article contributions.

A Life of Achievements in Chemical Engineering

Elena Gonzalez, Chief Editor



John Davidson and David Harrison (ChemEng Davidson Library, December 2013) at their 50th anniversary of publication of their book Fluidised Particles, first published in 1963

CEB hosted the Emeritus Professor John F. Davidson Symposium on 10 March 2016 as a tribute to his personal and academic contribution to the Department and the Chemical Engineering discipline. John's 63 years in the department has not only helped steer and develop the department during his years in office but, more importantly, he has also helped shape the Chemical Engineering discipline as a whole.

Professor Davidson has been a member of this Department since 1952 and was Head of Department of Chemical Engineering from 1975 to 1993. He is a Fellow of Trinity College. He was also IChemE President from 1970-71; he has been a Fellow of the Royal Society since 1974. In 2010, he was awarded the Prince Philip medal by the Royal Academy of Engineering for sustained excellence in Engineering.

At the Symposium event, colleagues and friends gathered not only to mark his recent 90th birthday but also to celebrate a career of remarkable achievements. As part of the event programme, several speakers took to the stage to share reminiscences of John's life and his impressive career as well as some comical anecdotes.

Sir David Harrison, former Faculty member and good friend of John, gave the first tribute speech taking attendees on a "Trip down Memory Lane": *'I have known John for exactly 60 years and it began in this way. The first Shell Professor — Terence Fox — was notably reluctant to appoint accredited Chemical Engineers when making his early staff appointments. He was launching Chemical Engineering Science in a sceptical and ancient university and not Applied Chemistry as UK Chemical Engineering was commonly seen at the time. The United States was different and Fox, prior to taking up the Chair here, had spent a year at MIT. He was determined his course would focus on the principles of thermodynamics, fluid and particle mechanics, reaction kinetics: in short, that students should acquire an ability to understand the underlying physical processes at the heart of the chemical and oil industries of the day. He strongly believed that graduates from such a course would be intrinsically more employable than those from courses which set store on a descriptive knowledge of the processes then used in the chemical industry. In furtherance of his aim, he set about recruiting young post- doctoral students in Engineering or Physical Chemistry, and this principle lead to John's appointment in 1952 and mine in 1956'.*

In the late 1950s, John and Sir David were drawn to research in Fluidisation, a subject quite removed from the work for their PhDs; and in this they were encouraged by Peter Danckwerts, Fox's successor as Shell Professor. John examined in the modest context of a Tripos research project, the rates of rise of large gas bubbles in fluidised beds and likened them successfully to the behaviour of large spherical- cap bubbles observed in gas- liquid systems; a phenomenon described by G I Taylor in a Royal Society paper in 1950 following work during World War II on the behaviour of large gas bubbles formed when depth charges are exploded at sea.

Incidentally, 53 years ago in this Department, John Davidson and David Harrison, as young researchers, were carrying out pioneering works on fluidisation, summarised in their book *"Fluidised Particles"*, published in 1963.

Around the same time Trinity elected him to an official Fellowship in 1957 and promptly made him Steward at the moment the College decided to undertake a full refurbishment of Trinity's Old Kitchen originally built in 1605. Even a more usual task falling to College Stewards, like settling sensitive seating- plans for College Feasts, also called upon John's administrative skills. He said of John; *'Some of you may have noticed that John is generally reluctant to allow 'too busy' as an excuse for any shortfall of high quality work'.*

On top of his College work, John carried a full load of teaching and examining in the Department and the

supervision of a growing number of postgraduates (a total of 49 in throughout the years). All this at a time when the Department itself moved here from temporary accommodation in Tennis Court Road. And, by the way, his family with Suzanne at home in 1957 included a son aged 3 and a daughter of 1. Yet despite all this, he formulated during this period a very elegant analysis of the exchange of gas between a rising bubble and the surrounding/ fluidised-particulate phase. This piece of theory, described in Chapter 4 of our *Fluidised Particles* in 1963, was beautifully confirmed by X- ray pictures of bubbles containing a nitrogen dioxide tracer taken by Peter Rowe and his co-workers at Harwell. John's original contribution was published in1961, as a discussion contribution to a Symposium on Fluidisation.

Several former members of Faculty and alumni travelled great distances to attend the milestone event and congratulate John on his life achievements.

Alumnus Dr Ben Harris, General Manager at Lucite International Limited, travelled from Singapore. Professor Jim Wilkes former Faculty member, travelled from Michigan in the US and several distinguished alumni Professors M. M. Sharma and Pandit Aniruddha, made the trip from the Institute of Chemical Technology in India, just to show John their appreciation. Professor Sharma was a Chemical Engineering research student here from 1961- 64m, supervised by Professor P V Danckwerts, who studied the kinetics of gas absorption. He has remained a good friend of John throughout the years. At his talk

Professors Roland Clift and Colin Pritchard in the exact spot (Lecture Theatre 2) where they did their final year research project in 1964. Professor Richard Darton suggested caption: "Budget cuts latest: Professors' new thought experiment needs no apparatus and no laboratory"

"JFD in Cambridge: Bubbles; JFD in Mumbai, My Forays into Cambridge", Sharma shared happy memories of their time together in Cambridge and Mumbai.

The Symposium illustrated Chemical Engineering as an international discipline. John and Sir David shared a number of very agreeable overseas visits over a period of 20 years in addition to periods of sabbatical leave in the United States and Australia. Everywhere they travelled, both John and Sir David were welcomed by former students or former senior visitors to this Department. One of their earliest visits was to the Soviet Union in 1966 at the invitation of the Soviet Academy of Sciences, with time in both Moscow and Leningrad.

John, nowadays known as 'The Founding Father of Fluidisation', has always had a very sharp mind as well as great strength of character, including an ability bring together pertinent experimental work and elegant theory based on first principles. Sir David commented; *'I saw this in action in 1970 at Chemeca, the first truly international conference put together by the Australian branch of IChemE and the Australian Academy of Science. The home team could not agree on whether the conference should be held in Melbourne or Sydney so it was staged in both, with one week in one city followed by a week at the other. In Melbourne, I was sitting next to John during the presentation of a paper from a British University which examined water droplets falling from a jet. The experimentation was good but the authors made awfully heavy weather when it came to an analysis of their results. John spent some time during the presentation with graph paper and when he contributed to the discussion session, courteous as ever, he complimented the authors on their experimental results but then dropped a bombshell by pointing out their results could be readily interpreted using Newton's laws of motion; and they might care to look at the graph he had just prepared. It is not for nothing that John has been a member of Newton's College for over 70 years.'*

One of John's key contributions outside Cambridge not to be overlooked: On 1 June 1974, there was a devastating explosion at Flixborough in Lincolnshire, which killed 28 people and seriously injured a further 36. The Department of Employment decided at once to set up a Court of Inquiry and John was asked to join the planned Inquiry. 70 days of public hearings extending to February 1975 made his sabbatical leave

to be deferred. In the context of an appalling tragic event, the Inquiry certainly gave rise to some Tripos questions.

John being awarded the first Bird,Stewart and Lightfoot IChemE Medal by Claudia Flavell-While

Dr David Brown, IChemE Chief Executive, described Professor Davidson's contribution to Chemical Engineering discipline and industry, adding that John had been an outstanding President of the IChemE. The highlight of the celebratory event took place immediately after when, Claudia Flavell-While (Director of IChemE Publications) presented John, unbeknown to him, with the first ever Bird, Stewart and Lightfoot Medal to be awarded for Exceptional Research in Transport Phenomena — a well- deserved merit for his life of dedication researching these phenomena, specially his own contribution into increasing our understanding of heat, momentum and mass transfer phenomena taking place inside multiphase systems, especially involving granular flows, fluidised beds and bubble columns.

It was in fact one of John's former research students, Laureate Professor Graeme Jameson who nominated John for the new IChemE Medal Award. Incidentally, Professor Jameson completed his PhD here in the 1960s, on the Behaviour of a bubble in a vertically oscillating liquid, under Professor Davidson's supervision. He went on to develop the Jameson Cell in the 1980s. His contribution to the Australian economy has earned him gold status within the minerals industry and the inaugural Prime Minister's Prize for Innovation in 2015.

Professor Chris Lowe covered "*The JFD-Biotechnology Link*". Professor Davidson was Chemical Engineering HoD in 1975 and was a member of the Committee for Biotechnology in the early 1980s. He interviewed Dr Lowe for the position of Director of Biotechnology. At first, Dr Lowe and his colleagues' humble beginnings were in a semi derelict hut on the Downing Site, known as the Biotechnology Centre. It then became the Institute of Biotechnology in 1988 and merged with the Department of Chemical Engineering in 2008.

Peter Davidson, ChemEng alumnus and John Davidson's son, gave a tribute talk "Davidson and Son: Mutual Support and Interests." The Symposium ended with Professor Davidson's comments on the previous speakers. The day was rounded off with an intimate dinner with John's closest friends at Trinity College's Old Kitchen, where a soprano provided some delightful after-dinner entertainment. John himself was extremely pleased with the event concluding; *'I enjoyed the afternoon and evening very much; it all went smoothly without a hitch.'*

Some alumni shared their thoughts after the event: Paul Stevenson commented; *'John has had so much impact on my life and it was great that I could recognise this via your organisation'.* Colin Pritchard added; *'That was a wonderful occasion (and I think my first return visit to Cambridge since my son's graduation in 1999!) Thank you so much for the invitation — I shall treasure memories of it — and keep up some renewed acquaintanceships.'*

If you couldn't make it to the Symposium, the tribute videos are available to watch on www.ceb.cam.ac.uk/news/news-list/jfd-symposium-63-years

Dinner with friends and alumni in Trinity College Old Kitchen, 10 March 2016

CUCES Welcome from President 2016 – 17

Nikolas Tipos, CUCES President

From left to right – Pawat Silawattakun, Pathorn Achakulwisut, Nikolas Tipos, Ray Aun Fan, Vidur Mehta, Adil Patwary

The academic year 2015 - 2016 was another successful year for CUCES, with a number of varied careers and social events. So, I would first and foremost like to congratulate and thank our previous Committee on the excellent job they have done this past year – many thanks Rachel Oldham, Emma Hall, Hannah Templeman, Vid Mehta, Ray Aun Fan, Mike Ryan and Hannah Bryson-Jones!

I would also like to thank everyone who voted in the recent CUCES elections. I am most fortunate to inherit the presidency of an extremely motivated and dedicated Committee, and I look forward to working alongside some of the keenest individuals I have had the pleasure of meeting. Huge congratulations to all of them on gaining their well-deserved roles – Ray Aun Fan (Careers Director, Part IIA); Vid Mehta (Events Director, Part IIA); Pawat Silawattakun (IT & Publicity, Part I); Adil Patwary (Treasurer, Part I); and Pathorn Achakulwisut (Secretary, Part I).

I am particularly pleased about the number of Part I students in our Committee this year. It is not often we have this many Part I students being passionate about getting involved in CUCES. In addition, it is a great advantage to have Ray and Vid on board with us again. They did a fantastic job in their (same) respective roles last year. Going forward, I am sure their experience will prove to be invaluable. In all, the future Committee has an interesting dynamic, a diverse ethnical background, and is as keen as ever to start their new jobs.

The emerging theme from the hustings was that students need greater exposure to the teaching consortium. Hence, we are aiming to organise additional networking events to give students the opportunity to intimately engage with employers from all fields, helping them better decide which field they would want to pursue. In addition, we are aiming to host case studies and workshops led by industry leaders in order to enhance students' understanding of our subject from a more practical standpoint.

Organising frequent site visits and insight days will also provide students with a better taste of the opportunities that lie ahead upon graduation.

We are very much looking forward to taking up our new duties. I hope that in a year's time, students will look back and feel that we have done an equally good job as a Committee.

Part IIB Research Project Poster Presentations Winners

Jason McCammon

From left to right – Sam Wibberley, Betsy-Ann Ward, Jacek Osinski, Ian Leung, Jason McCammon, Yeuk Nam Ho and Eamon Wan

On 1 March, students Ian Leung and Jason McCammon were one of the groups awarded a prize for their IIB research presentation and poster, on their work studying the application of antifreeze proteins in the cryo-preservation of blood. During the freezing process, antifreeze proteins interact directly with ice crystals and restrict their growth. This growth restriction has been shown to reduce the level of cryo-injury experienced by red blood cells during freeze-thaw cycles and thus demonstrates how antifreeze proteins could potentially function as a cryo-protective agent. Currently used cryo-protective agents, such as glycerol or dimethyl sulfoxide (DMSO), are limited by their toxicity and non-biocompatibility with blood. Antifreeze proteins have already seen commercial application within ice cream products in the food industry and thus are expected to overcome these limitations; however, further research is still being performed regarding this. The work performed by the students involved the production and purification of two naturally occurring antifreeze proteins and a novel design that they developed during Michaelmas term. This novel antifreeze protein was shown to display increased antifreeze activity compared to naturally occurring molecules and thus shows potential for its use as a cryo-protective agent. Further work, that is hoped to be performed during the Easter break, will involve combining the antifreeze proteins with sheep blood and testing their ability to reduce cryo-injury during freeze-thaw cycles.

CUCES Annual Dinner

Pathorn Achakulwisut, CUCES Secretary

CUCES Annual Dinner at the Cambridge City Hotel
Credits: Airlangga Gunawan

CUCES pulled off another great night to be remembered at this year's annual dinner, which was kindly sponsored by Shell and Schlumberger. Undergraduates, postgraduates, staff and alumni arrived at the Royal Cambridge Hotel clad in their best suits and dresses. Following a drinks reception, everyone was sat at their tables, all of which were aptly named in true ChemEng style, ranging from the usual dimensionless groups to the KSB equation.

Following a fulfilling three-course meal, speeches were made by Dr. Barrie, accompanied by resounding chants of 'PJB!', followed by Rachel, who introduced the new Committee to come up on stage. The highlight of the evening, however, began with the arrival of the port (perfectly distilled of course), which opened up the floor for the live rock band featuring Carmine and Bart on guitar/voice and bass. Next, Schlumberger-branded glow sticks were distributed, the lights were dimmed, and the real party began.

On behalf of the new Committee, I would like to thank Rachel and her team for all their hard work in organising fantastic events such as this one throughout the year, which has definitely made a huge difference to my experience as a Part I student since day one. Not only did I get to know people in my own year better, but these events facilitate the opportunity to meet with people from all the other year groups as well. I believe it is these sorts of events which make this department truly unique and special.

Frank Morton Games

Vidur Mehta, CUCES Social Secretary

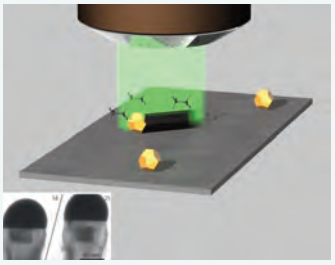
Cambridge Benchball Team Winners!

At 4 am on February 16, 70 sleepy Cambridge Chemical Engineers departed from the Pembroke street building to Manchester on a double-decker bus. We were not going for an industrial site visit or a field trip, but for the Frank Morton Sports Day; an annual event uniting the chemical engineering departments from around the UK over sports and socialising. After a few hours of driving and a quick stop at a Northern McDonald's, the University of Cambridge team arrived at the Manchester Central Convention Complex, making it for the final part of the careers fair. Within an hour everyone had split up and gone to one of the various venues in order to play their chosen sport. Cambridge fielded teams for rounders, table tennis, laser quest, chess, pool, tennis, Frisbee, badminton, benchball, bowling, dodgeball, tag rugby, football, and basketball as well as sending a few spectators. Each sport had its own tournament to determine a ranking of the universities.

By 1pm tournaments began to finish and people began to make their way back towards the Convention Complex or to a pub to begin the celebrations. In the end Cambridge came first in chess and benchball and did very well in several other sports. For the rest of the afternoon the various participants ate lunch, chatted with chemical engineers from other universities, drank a few pints, and bonded with their teams and coursemates. The bar crawl was a success, with Manchester's Lola Lo being a particular favourite. And although the final destination was too packed to fit everyone, the Manchester Union was a great end to the night for those who were able to enter. The Cambridge team departed Manchester at 1:30 am, and, exhausted from the day's activities, slept the whole way back.

Sensor CDT Students complete their mini-Research Projects

Dimitrios Simatos, CDT Sensors student



Bottom-up nanowire synthesis pursued by Omid Siddiqui

The second cohort of Sensor CDT mini-research projects has been completed. The projects were across eight different departments: Engineering, Chemistry, Physics, CEB, Materials Science, Neurosurgery, Pathology, and Pharmacology. Other participants include the Computer Lab, the Cognition & Brain Sciences Unit, and industrial partners such as Alphasense.

Along with Dr. Michael DeVolder and Professor Ferrari (CUED), Chris Valentine worked on developing a 3D carbon nanotube (CNT) gas sensor. In collaboration with Imperial College, the team developed, evaluated, and tested a gas-phase CNT modification method to use with their 3D CNT structures. Farah Alimagham worked with Professor Stephen Elliott (Chemistry) and Stephen Price (Neurosurgery) to develop a method that can detect 2-Hydroxyglutarate (2-HG): a substance produced 100 times more in tumour cells. This method could be used in surgery, making sure that the tumour has been completely removed.

Bogdan Spiridon's project was on nanostructured surface acoustic wave sensors (SAW). Supervised by Professors Andrew Flewitt (Engineering) and Alexei Lapkin (CEB), Bogdan set up a finite-element simulation platform to investigate whether the depth of penetration of the evanescent surface acoustic wave in a liquid can be affected by the nanostructure. Andrew Stretton worked on gas sensors for volatile organic compounds (VOCs) detection, guided by Professor Lisa Hall (CEB) and industrial advisor John Saffell (Alphasense), who has experience in commercialising this technology. John Saffell also advised student Pelumi Oluwasanya (along with Chemistry Professor Rod Jones) in investigating signal processing methods for NDIR gas sensors, for carbon dioxide detection.

Working in the Cavendish Laboratory, Dimitrios Simatos was advised by Professors Henning Sirringhaus and Sir Richard Friend (Physics), to develop additive-based organic field-effect transistor gas sensors with high specificity and stability. Olaf Hauk (MRC Cognition & Brain Sciences Unit) and Adrian Weller (Engineering) guided Simeon Spasov is his efforts to use pattern classification methods to decode semantic word categories from electro-/magnetoencephalography data.

Omid Siddiqui worked on laser induced material manipulation and synthesis of nanostructures in nanowires, guided by Dr. Stephan Hofmann (Engineering) and Professor Jeremy Baumberg (Physics). Alexandre Kabla (Engineering) and Richard Bowman (Physics), along with student Fergus Riche developed a low cost, open source fluorescence microscope capable of continuous live cell imaging over a period of two weeks.

Joseph Zammit worked with Dr. Ian Wassell (Computer Lab) and Dr. Ashwin A Seshia (Engineering) to develop a method for monitoring the structural health of a bridge with wireless sensor networks, using actual vibration data captured at multiple positions of the bridge. Apostolos Atsalakis was advised by Dr Vasant Kumar (Materials Science) and Dr Oliver Hadeler (CEB) to fabricate a breath analysis device that measures the human metabolism. Tristan Hughes worked with Dr Fernando Vanconcellos (CEB) and Professor Nathan Arokia (CUED) on disposable DNA/protein systems with microfluidics.

Oliver Vanderpoorten was supervised by Professor Clemens Kaminski (CEB) and Professor Tuomas Knowles (Chemistry). He worked on a 2-photon microlithography experimental setup for microscopic lab on chip devices. Miranda Robbins and Gemma Goodfellow were also supervised by Professor Kaminski, and supported by industrial partner MedImmune. Miranda worked with Professor Edwardson (Pharmacology) to measure protein binding affinities with AFM, while Gemma was co-supervised by Dr. Colin Crump (Pathology) to develop a rapid optical screening technique that measures the shape of virus particles.

The Sensor CDT students will now embark on their Sensor Team Challenge: a multi-disciplinary, challenging team project designed to test their skills and teamwork.

Reflections on Teaching

Dr David Scott, University Senior Lecturer

David Scott with Andrew Hoadley after Andrew's PhD ceremony in 1988. Andrew is now Associate Professor in Chemical Engineering at Monash University, Australia.

When I joined the Department in 1983, the undergraduate course started after two years of, usually, Natural Sciences or Engineering. We ran Fluid Mechanics and Transport Processes in NST IB, consisting of 60 lectures (including Saturdays) and all 10 experiments. The Chemical Engineering Tripos started with four weeks of lectures in the Long Vacation — the "Research Period" in July and August. At that time, the Department was a little different physically — there were no mezzanines; LT2 was where the Library is now, with a large double height laboratory the width of the building underneath; the Fluids Laboratory was where G16 and M1 are now; other Departments owned the space where CUBE and the Teaching Lab are now.

Formerly, the Design Project ran in the third year. This was not ideal, so in the 1990s, we designed the current arrangement, with Chemical Engineering starting in a student's second year in the University, after a year of Natural Sciences or Engineering; this works well. Fundamental Chemical Engineering is covered in Parts I, IIA, and IIB, with optional courses and the Research Project occupying the rest of IIB. In the 1980s, there was a third year Laboratory, which was dropped because of pressure on time and space. Exercises now form an important part of the course. Our aim of teaching fundamentals has not changed — we think it is the right thing to do and various external reviewers of the course, including the Teaching Consortium, have agreed. We try to *"make 'em think"*.

Parts of the current courses are very similar to what was taught in the 1980s. For example, Introductory Fluid Mechanics and Transport Processes have not changed much for decades, and that's fine. There was little biotechnology in the 1980s, whereas biotechnology is now an important part of the course, and features in every part of the Tripos. The IIB Research Project is still a significant part of 4th year activities and I find it impressive that it involves real research, which can lead to publications in the literature. Our students show their depth of knowledge, skills in analysis, presentation and enthusiasm in telling us about their work in the elevator and poster sessions and in their reports.

The delivery of the course has changed with changes in IT. In the 1980s, we used blackboards and chalk — I have seen big wooden compasses used to draw circles on the blackboard. Overhead projecting and PowerPoint are now mainly used, with lots of hand-outs. I like being able to write in real time and I agree with one colleague who said that copying from the board at least means that the material has to go through the brain. In 1983, we had a PDP-11/45 mini computer, which had about 256 KB of memory and about 10 MB of disk space; most people used cards for input. The old Fluids Laboratory had one early HP pocket calculator, which had cost so much that it was chained to the bench. If you used it to square 2 you got 4; if you then took the square root of that 4 you got 1.999999…. IT has moved forward enormously in the last 30 years and is now a very important part of the course, including word processing, a means of transmitting course materials, spreadsheeting and simulations and a source of information and communication. But this brings its own potential hazards, including being engrossed in important extracurricular matters in lectures, and thinking that having a PDF on the laptop means that the subject is understood.

I have tremendously enjoyed teaching in the Department — especially the 'mathsy' courses — and being part of the teaching team. Feeling responsible for the presentations and being grilled by critical students keeps me on my toes. I have enjoyed, too, seeing our able, energetic and wise students taking on the course, asking those difficult questions and then bouncing off into their careers in academia, industry, commerce, and a range of other areas. Very often, at the same time, they have been getting a lot out of and putting a lot into the wider Cambridge. And I have learned a lot of Chemical Engineering too!

Novel Method to quantify the binding Energy of Polymers

Dr Alessio Zaccone, Statistical Physics Group Leader

Macromolecules dissolved in liquids can self-assemble to form aggregates as soon as the liquid is no longer a good solvent. Using this mechanism, Poly(N-isopropylacrylamide) (PNIPAM) may be used to make temperature-dissolvable drug delivery capsules. But before that, the binding energy between the macromolecules must be characterised and quantified.

Dr Alessio Zaccone presented a new method to quantify the binding energy between associating polymer molecules in water-alcohol mixtures by simply measuring the size of growing aggregates as a function of time, starting from the instant at which the intermolecular attraction is switched on. The method has now been successfully applied to the self-assembly of PNIPAM co-polymer micelles in water-alcohol mixtures using neutron scattering. Alcohol molecules in the water solution alter the binding energy between the macromolecules and this mechanism can be exploited to fine tune the self-assembly process. By applying the method, it was possible to quantify the change of binding energy as a function of the concentration of alcohol molecules, and of their molecular size. The results suggest that the alcohol molecules disrupt the highly-structured hydration layers on the residual hydrophilic segments of PNIPAM, thus reducing the hydration repulsion and increasing the binding energy[1].

This method is much more practical and quantitative than the standard measurements of second virial coefficient, and requires a much lower number of measurements at small scattering angles, without having to span the whole range of scattering angles. Furthermore, the method is applicable to different scattering techniques, depending on the size of the macromolecules or colloids, which include neutron, X-ray and light scattering, and in future studies it could be profitably applied to the quantitative study of biomolecule self-assembly.

[1]www.ceb.cam.ac.uk/news/news-list/a-new-method-to-quantify-the-binding-energy-of-associating-polymers-with-neutron-scattering

New Insights into Parkinson's Disease Mechanisms

Dr Gabriele Kaminski-Schierle, Molecular Neuroscience Group Leader

The self-assembly of normally soluble proteins into fibrillar amyloid species is associated with a range of neurodegenerative diseases such as Parkinson's disease. The research team led by Dr Gabriele Kaminski-Schierle has monitored the fate of different forms of alpha-synuclein: the protein associated with Parkinson's disease. The results suggest that the same protein can either cause or protect against the toxic effects that lead to the death of brain cells, depending on the specific form it takes, and that toxic effects occur upon an imbalance of the level of protein present in its natural form in the cell. The work could help unravel how and why people develop Parkinson's, and aid in the search for potential treatments. The study is published in the journal *Proceedings of the National Academy of Sciences*.

Using super-resolution microscopy to observe the behaviour of different types of alpha-synuclein, the researchers found how alpha-synuclein effects neurons, and at what point it becomes toxic to neurons. They used different forms of alpha-synuclein and observed their behaviour in neurons from rats, correlating what they saw with the amount of toxicity that was present. They found that when they added alpha-synuclein fibrils to the neurons, they interacted with alpha-synuclein protein that was already present in the cell, and no toxic effects were present. When the authors added a different, soluble form of alpha-synuclein, it didn't interact with the protein that was already present in the neuron, and it started to grow, creating a toxic effect.

The researchers then observed that by adding the soluble form of alpha-synuclein together with amyloid fibrils, the toxic effect of the former could be overcome. The research demonstrates the importance of fully understanding the processes at work behind neurodegenerative diseases, to target the right step in the process.

The research was funded by the Medical Research Council, the Engineering and Physical Sciences Research Council, and the Wellcome Trust.

Biotech Discoveries that changed the World: *Saccharomyces cerevisiae,* The Budding Star

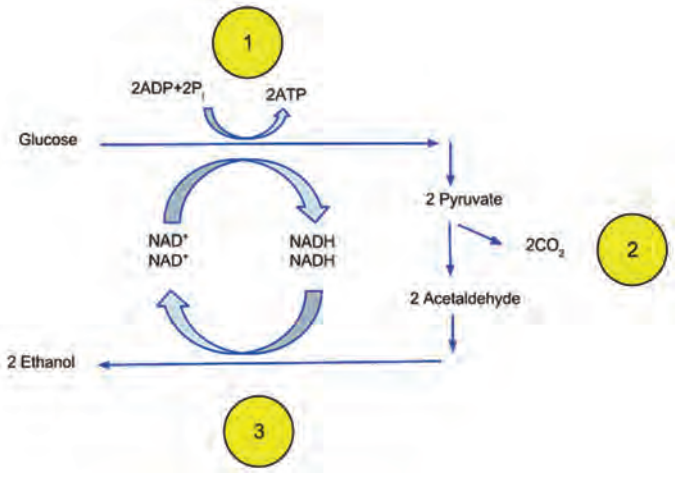
Dr Ljiljana Fruk, CEB Lecturer and Bio-NanoTechnology Researcher

Yeast buds

According to Paleogenetics (and yes, this field exists!), the origin of fermentation can be traced to the late Cretaceous period (around 66 million years ago) when lots of flowering plants emerged and fruit sugars became increasingly available. However, the common ancestor of fermenting *Saccharomyces* species, emerged even earlier, around 100 million years ago, and underwent a process of genome duplication. This had a profound effect on the genome structure and led to the appearance of many genes with new functions. A group of such new genes became specialised in using available fruit sugars as a source of energy leading to anaerobic fermentation process resulting in production of ethanol. One would probably not question the production of ethanol waste at all, considering the joyful effects that it has on other species, but in fact, ethanol was first used as a very useful toxin. Yeast was employed as a weapon to kill off competing microbes and did so with remarkable efficiency.

Long time after yeasts perfected the art of fermentation, humans stumbled upon alcohol when climbing down the trees. In fact, Paleogenetics has shown that alcohol dehydrogenase, the enzyme that degrades alcohol, evolved to be very effective (even 40 times more efficient for ethanol metabolism) around 10 million years ago when common ancestors of humans, chimpanzees and gorillas, started roaming the ground and stumbled upon slightly rotten (and very happy fruits) laying around and were not eating only fresh stuff directly from the trees. From then on the history of biotechnology was 'written': we do not really know when the things started being "technlological" and the process more formalised, but the first written account of the use of yeast to make leaven bread and alcoholic drinks dates back to old Egypt (5000 BC). The first recipe for beer is dated from around 3900 BC and was found in Mesopotamia. It describes a preparation of the "liquid bread", as it used pieces of leaven to make beer.

However it wasn't till the work of Louis Pasteur came to light in the late 1860s that yeast was identified as a living organism responsible for all these processes. Nowadays we still use the same biotechnological process (although a bit more refined!) and different yeast species to produce beer and bread, both of which had a large impact on our culture and the course of civilisation. Overtime, yeast has not only become an increasingly valuable food ingredient we regularly consume but it is an extremely important organism for studying ageing and evolutionary developments. With this is mind, next time you make bread or enjoy a pint of ale, take time to reflect on the remarkable age and beauty of this humble-looking organism that did truly change our world.



Ethanol fermentation

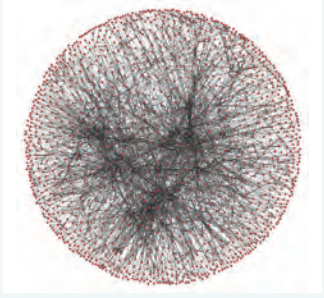
Sustainable Reaction Engineering: An Overview

Professor Alexei Lapkin, Sustainable Reaction Engineering Group Leader

Sustainable Reaction Engineering is a bit of a mouthful. What I really mean by this is the development of reaction engineering tools, fit for the new societal challenges, to create a more sustainable society. The *environmental* aspect of sustainability requires us to avoid toxic emissions, improve resource efficiency of processes and avoid secondary effects, such as changes in land use. A well-publicised example of change of land use is the transformation of native forests in Malaysia into palm plantations for the production of first generation biodiesel.

Resource efficiency could be addressed in several ways: through better use of available fossil resources, through use of wastes such as agricultural and food waste, and through reduction of dependence on critical materials.

In the group, we work on selective oxidation of alkanes to improve the utilisation of fossil resources and to reduce emissions of greenhouse gases. We also work on the utilisation of bio-waste, such as food and paper industry wastes, some containing terpenes and others containing fatty acids. For all processes, we identify reaction mechanisms and the most active/selective catalysts, rate-determining steps and then develop a predictive reaction model, which can allow us to design the best reactor/separator configurations.



Data Mining: Part of a Network of Organic Reactions

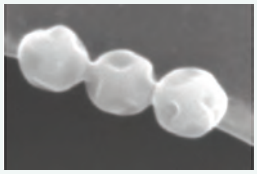
One of the key challenges in developing new processes based on renewable feedstock, is to identify the most important new platform molecules and the best routes to new functional products, from a large number of technically feasible alternatives. We develop a 'Big Data' approach to chemical knowledge at CEB: mining for existing chemical knowledge in databases and automating evaluation of routes to find the gaps in our knowledge. Such gaps are the reactions that are not yet known. We also make use of predictive tools of computational chemistry to assess the feasibility of potential new reactions. Computational screening methodology allows us to generalise the mechanism of a class of reactions, validating the methodology through fitting to all examples from literature found by data mining. The generalised models can then be used to predict new reactions.

The processes of conversion of bio-feedstock or waste feedstock into functional molecules are multi-step synthesis, with many alternatives for reactions and separations. To guide process design and optimisation, we are developing a *function*-based process synthesis methodology aiming to identify the opportunities for process intensification — a way to reduce process footprint and/or to increase its space-time-yield. A function is a physical or chemical mechanism contributing to the overall process, which frequently depends on the composition of the chemical system and the reaction conditions. Identification of the mechanisms is critical for model building and developing process understanding. As function-based models do not depend on our current or past views of unit operations, the optimal design of a flowsheet may suggest new unit operations.

Environmental impact is best assessed using Life Cycle Assessment (LCA) tools. We perform LCA of new chemical processes to identify environmental hot spots and guide process development towards the reduced overall environmental impact over a very broad system boundary. Our current challenge is to link LCA with process synthesis, such that we could use life cycle environmental impacts as parameters in the multi- criteria global optimisation of process options.

The *economic* aspects of sustainability of interest to us include faster process/ product development and improved cost-efficiency of processes. In specialty chemicals and pharmaceuticals, the manufacturing processes are rarely optimised due to the pressure of bringing new products to the market faster. To properly optimise a process, we need to have a good

process model. However, this is difficult when reactions are multi-step, multi-phase with multiple separation steps and involve stoichiometric additives, the role of which in reactions is not well understood. In such cases, statistical, data-driven optimisation is a good tool. Together with statisticians, we develop machine-learning algorithms to run our automated experimental system. This approach has already been proven successful in target optimisation (for yield and product quality, or yield and cost) of emulsion polymerisation and of an organometallic catalytic reaction. The challenge is to generalise this approach to more complex optimisation tasks and for robotic experiments.



TEM Image of Emulsion Polymerisation Nanoparticles

Improvement of cost-efficiency could also be achieved by reducing the energy utilisation of the processes and intensifying them. One way of intensifying an existing plant is to run it under real-time economic optimisation, which requires a predictive process model and an ability to measure many process parameters, including compositions and also product quality in real-time. Our long-standing interest in monitoring reactions *in situ* has found a new challenge: how to measure not only concentrations, but also for example nano-particle size distribution and shape-distribution during their large-scale manufacturing, focusing on real-time sensing techniques. Incidentally, we have now teamed up with electrical engineers and material scientists in Cambridge in an EU project to develop acoustic imaging, optical spectroscopy and electron microscopy techniques for real-time monitoring of particle size and shape. The benefit of doing this has been seen in our previous EU project when up to 30% reduction in the run time of a process was achieved through application of a model-based predictive controller.

Current Group Members:

Dr Parminder Kaur Heer obtained her PhD from Institute of Chemical Technology, Mumbai, in Process Systems Engineering. She is working on process synthesis methodology and applying it to conversion of terpenes to platform molecules and functional molecules.

Dr John Suberu obtained his PhD from University of Warwick in Biomedical Separations and Analytics. He is working on transmission electron microscopy imaging of polymer nanoparticles.

Dr Polina Yaseneva obtained her PhD from Cardiff University in Heterogeneous Catalysis. She is working on catalysts for selective oxidation of alkanes and, in parallel, on life cycle assessment.

Mr Philipp- Maximilian Jacob has MPhil from Cambridge (ACE). His PhD is on Big Data approach to chemical process synthesis.

Mr Sam Aworinde has MPhil from Cambridge (ACE). His PhD is on selective oxidation of alkanes.

Mr Jacek Zakrzewski has MEng from Warsaw University of Technology, Chemical Engineering. His PhD is on developing continuous flow C-H activation processes (late functionalisation of drug intermediates).

Mr Yehia Amar has MEng from Imperial College, Chemical Engineering. His PhD is on design of experiments methodology for enantioselective hydrogenations.

Mr Eric Bradford has MEng from Imperial College, Chemical Engineering. His PhD is on optimisation and design of experiments for complex chemical processes.

Mr Nicholas Jose has MEng from Berkeley, Chemical Engineering. His PhD is on microfluidic TEM imaging for mechanistic studies of nanostructure formation.

Ms Liwei Cao has BEng in Chemical Engineering from Tsinghua University, Beijing. Her MPhil by research project is on computational screening for new reactions.

Mr Artur Schweidtmann is joining the group in April for 6 months as part of the Erasmus exchange agreement with the group of Professor Alexander Mitsos, RWTH Aachen, for his Masters research project. He will work on model identification.

Innovation requires Time and a bit of Luck!

Emeritus Professor Malcolm Mackley, Voluntary Research Associate

Professor Malcolm Mackley

Making a discovery can occur quickly; however, turning a discovery into a useful innovation usually requires time and a bit of luck. The word luck is not something engineers and scientist often talk about or code into their computations, but being lucky is often something that is necessary if your discovery is going to make an impact. Some say, "People make their own luck". This can be true although it is only part of the story; external factors can also play a huge role in developing an innovation and so in general you need to be lucky!

The CEB invention of Plastic Microcapillary Films (MCFs) is an example of the roller coaster ride that can occur in turning a discovery into a commercial innovation. In 2004, Bart Hallmark and I invented a way of extruding an array of small diameter microcapillaries into a plastic film. At the time, the logic of the work was to "engineer" voidage into plastic rather than rely on the vagaries of the gas nucleation process to foam a plastic. An example of an early MCF extrusion profile is shown in the photo below. We persuaded Cambridge Enterprise (CE) to file a patent application and then set off on a long roller coaster ride to commercialisation.

Plastic MCF, Credit: Christian Hornung

One of our initial problems was, "what are we going to use MCF for?" CE brought in Consultants and there were extensive Product Design exercises within CEB and the Judge Business School to try and tease out application areas. Lots of ideas but no real direction.

Dr Bart Hallmark

There can be a million reasons why an invention does not become a useful innovation and a necessary requirement to battle through the fog of hurdles is to have true champions of the invention. I was a believer but not necessarily a full champion; being a Cambridge academic means having many different priorities in terms of balancing research, teaching and administration. We did, however, find a loyal "believer" within CE, Maggie Wilkinson, who helped us particularly through the dark phases of the innovation. We also found two real outside champions who enabled the MCF story to become a commercial reality. Patrick Hester is a remarkable businessman who has built up a SME Company Lamina that specialises in extruding a high performance plastic Flourinated Ethylene Propylene (FEP). Patrick took out a licence from CE and he subsequently formed a sub company with another of my ex-PhD students Nuno Reis and an ex-CEB Post-doc Ali Edwards, where they are applying MCF technology to medical diagnostics (www.capfilmtech.com). In addition, Lamina have developed a very clever and elegant MCF Flow Chemistry microreactor which shows great promise, however, they have little experience in the field of flow chemistry and so they themselves need a further flow chemistry champion in order to make that innovation a commercial success. Our own second champion was Dr Rudy Koopmans from Dow Chemicals. Rudy is a life long research colleague and he championed MCF technology within Dow. It has taken many years to get Dow on board as following our invention declaration, Dow developed their own in- house MCF technology and initially Dow patent agents argued that because of certain prior art they did not need to take out a licence with Cambridge. Rudy was well aware that the invention came from Cambridge and after a very long battle, Dow agreed to take out a licence too. Hopefully, in the next few

years you will be seeing throughout the world, new MCF technologies including plastic packaging that is either lighter than existing packaging or packaging that use less polymer for the same performance. The photograph below shows a Dow Chemicals thin plastic sheet on top of a £2 coin that contains "thousands" of MCF micro channels. Plastic packaging is an end use that does not necessarily receive a very good press; however "Plastic is Fantastic" if used and disposed of in the right way.

Dow Chemicals plastic MCF packaging film

Every innovation is different, however, usually it takes time to come to the realisation of the concept and time scales of five to twenty years are entirely realistic and usual. During the innovation stage, you must have champions from within or outside who really believe in the innovation. These people are special; they are believers; people who are prepared to work through the tough times and weather; either the stormy waters or find ways around the rough patches. Sometimes, they are people who are prepared to put their own job on the line for the sake of the innovation. Throughout all of this they will almost certainly need a bit of luck. So good luck to all you future inventors and innovators; you may need it!

"being a Cambridge academic means having many different priorities in terms of balancing research, teaching and administration"
Professor Mackley

Innovation in Business: CEB in KPMG International Competition

Left to right: Graham Mills, Theresa Maier, Evaline Tsai and Lukas Wittern

WD Armstrong Scholar Theresa Maier of the BioScience Engineering Group and Peterhouse Research Student Evaline Tsai of the Analytical Biotechnology Group were selected to compete in the KPMG International Case Competition (KICC) in Dubai in April 2016. KICC is the largest case competition of its kind, enabling students from all over the world to develop innovative solutions to complex real-world business challenges. Over 20 000 applications were drawn from more than 390 universities across 22 countries, with only 88 participants selected to compete in the World Finals in Dubai.

PhD students Theresa, Evaline, as well as their friends Graham Mills (PhD Cancer Research) and Lukas Wittern (PhD Plant Science) had the honour of representing the UK at KICC, having won the KICC UK Finals in December 2016 via a multi-stage selection process. During the World Finals in Dubai, the team worked on an innovative business strategy for a client in the luxury hotel market, solving multiple complex case studies with subsequent presentation and Q&A discussion.

"Participating in KICC was a huge privilege and a great opportunity for our personal and professional development. We hope to serve as an example for other CEB students, who have the potential to be very competitive in business competitions such as KICC." – Theresa

"KICC was an unforgettable experience. We learned so much about evaluating real-world business problems while getting the chance to travel to new places we had never been before. We highly recommend CEB students to apply to next year's competition." – Evaline

Theresa Maier's doctoral work focuses on the development of a novel paediatric drug delivery device used during breastfeeding; Evaline Tsai investigates upconversion nanoparticles for biosensing applications.

Industry Business

Overview
The joint Chemistry-CEB Workshop with Synthomer proved to be an enjoyable and stimulating one. Follow-up meetings are being scheduled.

CEB has started running industry networking events with key leaders of industry aimed at discussing potential external collaborations. The last networking event took place on 28 April.

Company Highlights

Synthomer

CEB and Chemistry held a joint workshop with Synthomer, in the Hauser Forum, on 15 March. CEB was represented by Alexei Lapkin, Alessio Zaccone, and alumnus Mark Perrett. They were joined by delegates from Engineering, Cambridge Enterprise and 5 Synthomer employees, including Dr Roeschlaub Head of R&D in Performance Polymers and Innovation. Syndicates at the workshop discussed topics including on-line measurement of monomer conversion during polymerisation and solution polymerisation processes.

Participants reported afterwards that they had really enjoyed the workshop and follow-up meetings are being arranged between CEB and Chemistry. Gratefullness to Nigel Slater for his work in setting up the contact with Synthomer. Synthomer is one of the world's major suppliers of naturally derived polymers. Their products appear in coatings, construction, textiles, paper and synthetic latex gloves.

LGC

A meeting was organised by the UoC Business Strategy Office for Enterprise PVC Nigel Slater and the UoC Knowledge Transfer Facilitators are to meet 3 senior representatives of LGC, in the Old Schools on 4 March. LGC (formerly the Laboratory of the Government Chemist) is an international life sciences measurement and testing company, building world leading positions in sustainably growing markets.

Sanofi Genzyme

Chris Lowe and Graham Dransfield visited Sanofi Genzyme in Haverhill on 8 March. Sanofi Genzyme evolved from a tiny start-up to one of the world's leading biotech companies, with nearly 10,000 employees and operations in every region of the globe. This includes a large manufacturing facility in Haverhill, employing around 300 people, where they produce the active ingredients for a product, which is used to treat patients on kidney dialysis. Acquired by Sanofi in 2011, Genzyme now benefits from the reach and resources of one of the world's largest pharmaceutical companies.

NB Undergraduates Sanofi Genzyme are looking for up to 8 students for work placements throughout 2016. Please contact Graham for further details.

Impact

IoB welcomes New PIs Event

The Event held on 19 January proved to be a great success. Over 40 people were packed into the IOB tea room to witness a wide range of talks, with topics from biological warfare to wearable technology. The event generated considerable enthusiasm. An unexpected bonus was the very positive response of the industrialists present. As a result, a follow-up event has been arranged, where companies will talk to CEB and other invited guests, with a view to facilitating collaborations. Organisations expected to make presentations include Medimmune, Magna, Sanofi, CPI, Synthomer, Lucideon and the Biotechnology Knowledge Transfer Network (KTN).

H2020/MSCA

CEB was successful with 2 out of 6 submissions to the Chemistry Panel for the Maria Sklodowska Curie Actions (MSCA). This represents a significant improvement on the previous year and is a very good performance, given that the funding threshold is well above 90%. The newly appointed MSCA Fellows, Tan Kuan Boone and Hirak Kumar Patra, are expected to join the department soon and will be supervised by Ljiljana Fruk.

Industrial Networking

A highly successful Industrial Networking Event was held on the afternoon of 28 April, attracting 11 companies and external organisations, with interests ranging from automotive components to tackling the Zika virus (truly A-Z). Around 30 people crammed into the venue to listen to the talks and to network. Speakers presented on behalf of the following organisations: Immaterial Ltd, Wilton Centre, Sanofi Genzyme, Synthomer. KTN (Industrial Biotechnology), Magna Engineering, eScent, Frontier IP, CPI, NPL and Lucideon.

Lively discussions resulted from the talks – one striking feature was the synergy between the seemingly disparate companies. Opportunities for the department include student placements, job vacancies, help for spin-outs, and future research collaborations.

This is the first such event in recent times. Let's hope that it can be repeated, in the more spacious surroundings of the New Building, in the near future.

Horizon and Centauri launch Avvinity

Horizon Discovery Group, the leading international gene editing company, and Centauri Therapeutics Limited, a UK-based biotechnology company, announced a jointly managed immuno-oncology venture: Avvinity Therapeutics. Part of Horizon's £10M investment plan, Avvinity aims to discover and develop novel molecules targeting life-threatening infectious diseases.

By combining Centauri's Alphamer technology with Horizon's gene editing, oncology, and drug delivery, Avvinity will develop novel immune-oncology therapeutics for solid tumours and leukaemias, targeting a £25M market[1]. Alphamers promise the ability to target cancers driven by both wild type ("normal") as well as mutant ("abnormal") gene overexpression. Their short half-life in the body reduces toxicity and systemic side-effects.

Dr. Darrin M. Disley, CEO, President Research Biotech of Horizon Discovery Group plc, said: *"By combining Horizon's deep understanding of the genetic basis of cancer alongside its gene editing, drug discovery and emerging immuno-oncology toolbox, with Centauri's unique Alphamer technology and knowledge of its use, we have created an exciting new company to spearhead Horizon's move into targeted therapeutic development. We are confident this joint venture will break new ground in the development of immunotherapies, and bring significant value creation to Horizon shareholders."*

Dr Disley recently won the Queen's Award for enterprise promotion, and invested $150,000 in a social venture setting up the world's first chain of sustainable cafes[2].

Dr Darrin Disley, HD Group CEO and Bio alumnus

[1] www.horizondiscovery.com/about-us/news/horizon-discovery-group-plc-enters-immuno-oncology-therapeutic-development-and-forms-joint-venture-with-centauri-therapeutics-limited

[2] www.cambridge-news.co.uk/Queen-s-Award-2016-Enterprise-champion-Disley/story-29146330-detail/story.html

CCNR's New Spin-off: PsyOmics

PsyOmics team from left to right: David Holden, Sureyya Ozcan, Sabine Bahn, Dan Cowell, Jason Cooper, Jordan Ramsey and Diarmuid Kenny

For the last 15 years the Bahn laboratory has been conducting an extensive research program to define the molecular basis of schizophrenia, bipolar affective disorder, major depressive disorder and autistic and anxiety spectrum disorders. The Cambridge Centre for Neuropsychiatric Research (CCNR), under the direction of Professor Bahn, conducts and coordinates fundamental and applied research into the causes and treatment of major neuropsychiatric disorders, focusing on biomarkers and novel target discovery.

Despite the fact the major depression is thought to be the second leading cause of disability worldwide and a major contributor to the burden of suicide and ischemic heart disease, obtaining funding for research and development of novel treatments is very challenging. The researching funding received in mental health is considerably less than other therapeutic areas. Approximately £9.75 is invested in research per person affected by mental illness – over 100 times less than the £1,571 amount spent on cancer research per patient.

PsyOmics was formed in March 2015 with the aim of building on the know-how, expertise and IP of the CCNR to improve the prevention, diagnosis and treatment of psychiatric disorders. Supported by the University we have been fortunate to raise initial seed funding to establish an office on the Cambridge Science Park and start on our journey of delivering improved prevention, diagnosis and treatment of psychiatric conditions.

We aim to:

- Improve treatment by providing contract research services to support clinical trials for psychiatric treatment
- Improve diagnosis by developing clinical diagnostics.
- Improve prevention by providing quantified health solutions that are accessible to everyone, empowering people to understand and improve their own wellbeing and mental health.

Our initial focus will be on the early detection and diagnosis of bipolar disorder. Presently, 1.1m people present with depressive symptoms to their GP every year in the UK. This group includes those with undiagnosed major depressive disorder, undiagnosed bipolar disorder and those with symptoms that are below the clinical threshold. The appropriate stratification and treatment of these groups is very challenging as patients with an underlying bipolar disorder typically present with depressive symptoms that are indistinguishable from those of major depressive disorder. The psychiatrists surveyed by PsyOmics explained that the diagnosis of bipolar disorder is particularly difficult for those under 35, where symptoms of hypo(mania) are less likely to be reported.

Misdiagnosis is further exacerbated as GPs often have only 5-7 minutes to assess these patients and antidepressants are often therefore prescribed as a default. Consequently, around 40% of all patients with an underlying bipolar disorder are initially misdiagnosed with depression and prescribed antidepressant monotherapies. This leads to an average period of 7.5 years for the correct diagnosis to be reached. This misdiagnosis has detrimental consequences for both the individual patients and the healthcare system. Antidepressant monotherapies are ineffective in the treatment of bipolar disorder and, furthermore, they are known to lead to an increased risk of anti-depressant induced mania, rapid cycling and suicide attempts among these patients, all of which lead to an increased rate of hospitalisation and healthcare costs.

We hope to bring to market a simple blood based biomarker test that will aid in the correct diagnosis of bipolar disorder and shorten the time to receive the correct treatment.

If you wish to contribute to the research going on in the CCNR, the group is currently conducting an initial study to investigate the protein changes in blood spots self-collected by volunteers on a filter paper in combination with an online questionnaire.

Details of the study can be found at www.spot-depression.org

Professor Davidson awarded first Bird, Stewart and Lightfoot Medal

Prof John Davidson was awarded the first Bird, Stewart and Lightfoot medal since it was launched in 2014. The award committee of the Institution of Chemical Engineering (IChemE) nominated Prof John Davidson for his outstanding and recognised contribution research in Transport Phenomena.

Researchers who can be awarded the medals and prizes should have made exceptional contributions in the field and meet certain criteria. These involve: genuine pioneering work in fluidisation and mass transfer, outstanding contribution over many years, and remarkable association with developing the field of fluidisation and has a major contributions within and beyond the scope. The award is named in honour of Chemical and Biological Engineering Professor Emeritus Byron Bird, Chemical and Biological Engineering Hilldale Professor Emeritus Edwin N. Lightfoot, and the late McFarland-Bascom Professor Emeritus of Chemical and Biological Engineering Warren Earl Stewart. Congratulations for Prof Davidson.

PhD Student Evaline Tsai selected as a NanoDTC Associate

First year PhD student Evaline Tsai in the Cambridge Analytical Biotechnology group was selected as a NanoDTC Associate after competing at the Cambridge Nanoshowcase on 27 Jan 2016. Applicants from several departments across the University gave 2-minute presentations on research related to nanoscience. Evaline presented her work on upconversion nanoparticles for bioimaging and photodynamic therapy. When the nanoparticles are excited in the near-infrared range, they emit visible light that can activate photosensitizers to release singlet oxygen to kill cancer cells for non-invasive cancer therapy. Associates receive a £3000 travel grant and an opportunity to participate in a number of events organised by the NanoDTC as well as the chance to organise events of their own. Evaline is currently planning a tour to a startup located in Cambridge Science Park to give NanoDTC students and Associates more exposure to entrepreneurship. Afterwards, she will be traveling with NanoDTC students and Associates to the 2016 Autumn School in Croatia in late September to attend a mix of science talks, discussions and other activities. She is thrilled to have received the travel grant, which she plans to use for attending conferences to share the results of her research with others in the scientific community.

JustMilk wins Pitch@Palace

JustMilk, a company founded by CEB PhD students Rebekah Scheuerle and Theresa Maier, won the first place in PitchPalace 5.0, a competition hosted by His Royal Highness the Duke of York, giving start-ups an opportunity to pitch their ventures to key stakeholders that can support their business development. Ms Scheuerle and Mairer pitched about their novel device for administering life-saving medicines to infants during breastfeeding.

The event hosted in St.James Palace on 7 March 2016, where 14 ventures pitched after winning the PitchatPalace Bootcamp. There were over 400 leaders from organisations including grant funding agencies, venture capital companies, pharmaceutical companies and NGOs. CEB winners had the opportunity to network with supporters to assist in scaling and implementing their device.

Important Lessons learned during my Bio PhD Years

Dr Sridhar Iyengar, Elemental Machines CEO & Founder

I am not alone in having a career that has grown in interesting directions, built on a deep and broad foundation forged during my time at the Institute of Biotechnology (now part of CEB). The combination of the team with which I was fortunate enough to work and the rigorous environment at the IoB work have shaped who I am and paved my path since leaving in 2000. Coming from the US, I received a Marshall Scholarship, a U.K. taxpayer- funded program in honor of the Marshall Plan, to pursue my work around diabetes and glucose monitoring. Whilst excited for the opportunity, I did have to put my career as an aspiring rock and roll drummer on hold, much to my mother's relief. Little did I know at that time that coming to Cambridge to work under Professor Lisa Hall, *CBE*, was going to be life- changing.

What was impressed upon me at every stage of my research — no matter how complex — was to be crystal clear on the practical applications. Why are you doing something? What are the real- world use cases? Since leaving the program, I have founded three companies, each of which has been a different expression of my interest in the intersection of biology with technology and involved people I had the privilege of meeting at CEB. My contributions continue to be influenced by lessons learned in the program, including:

The Elevator Pitch: We were asked at the end of our first year to use a single slide and present a year's worth of complex research to an audience of 100+ in two minutes in a simple, compelling and informative way. That's pretty much the gist of an "elevator pitch". Whilst we were agonising over how we could possibly present such esoteric research in 2 minutes, we were not aware that we were learning one of the first lessons of alluring investors into a startup!

Dirty hands: Graduate school is a lot closer to a startup than you may think — it's about how to get things done when you are vastly under- resourced and you are the only one there to do it! The willingness to do anything, formed in the research environment, is an attribute that has served me well in every entrepreneurial adventure.

Improvisation: Not in the theatrical or musical sense, but creative solutions to business and technical problems are always required in academia and startups and finding clever technical substitutes for key equipment is a point of pride. In one case, we did not have access to the proper oven to desiccate chemicals, but it turns out that a beef jerky maker for £20 did an excellent job. In another example, we were able to disassemble and reuse inexpensive £30 toy microscopes for key work, rather than purchase a prohibitively expensive one that we couldn't justify on a startup budget — small examples, but indicative of the mentality forged in academia that translates well into startup life.

Beyond the imprint of those core lessons, members of the CEB community continue to play active roles in my companies, including Professor Lisa Hall serving as scientific advisor at AgaMatrix and ongoing work with Professor Justin Gooding, a researcher who subsequently moved to Sydney but who was kind enough to share his lab with us when we were getting AgaMatrix off the ground. Coincidentally, one of his PhD students from that time, Elicia Wong, is now my co- founder and CTO of Elemental Machines.

As for the Marshall Scholarship, I'm proud to say that AgaMatrix established sales, marketing and distribution operations in the UK, employing dozens — and hopefully repaying the Marshall Scholarship's investment in me. And, my career as a drummer remains on the back burner — for now.

CV Dr Sridhar Iyengar

A serial entrepreneur in connected medical devices and wearables, He holds over 30 US and international patents and international patents:

- 2014: Founder and CEO at Elemental Machines, focused on strategy and management.
- 2013: Founder and Director of Misfit, makers of elegant wearable products, acquired by Fossil in 2015.
- 2001: Founder of AgaMatrix, a blood glucose monitoring company that made the world's first medical device connecting directly to the iPhone.
- 1999 PhD, MPhil in Biological Sciences received his Ph.D. from Cambridge University as a Marshall Scholar.
- 1991 –95 University of Illinois at Urbana-Champaign BS, Electrical Engineering.

Akshay Deshmukh awarded Ashok Kumar Fellowship

CEB ChemEng graduate Akshay Deshmukh has been awarded this year's Ashok Kumar Fellowship enabling a Chemical Engineering researcher to spend three months working in the Parliamentary Office of Science and Technology (POST). The Fellowship is jointly funded by the Institution of Chemical Engineers (IChemE) and the North- East of England Process Industry Cluster (NEPIC).

Akshay graduated from the Department in 2013 and is currently pursuing a PhD in Chemical and Environmental Engineering under Professor Menachem Elimelech at Yale University in Connecticut, USA. His research focuses on the water-energy nexus and improving the understanding of transport phenomena in energy efficient water desalination processes. While at POST, Akshay will be responsible for working with Scientific Advisers to research and write a short briefing document ('POSTnote') on a science and technology topic for MPs and Members of the House of Lords. Dr Ashok Kumar was a Chartered Chemical Engineer and IChemE Fellow who served as the Labour Member of Parliament (MP) for the Middlesbrough South and East Cleveland constituency until his sudden death in 2010. Previously, Dr Kumar had worked as a research scientist for British Steel at the Teesside Technology Centre in Grangetown.

POSTnotes provide parliamentarians with a concise, balanced, and unbiased analysis of a complex body of scientific evidence from a diverse range of academic, industrial, and governmental sources. The briefings, which are downloaded over a million times each year, help MPs and Lords scrutinise government policy during parliamentary debates and select committee hearings. Previous Ashok Kumar Fellows have co-authored POSTnotes on Energy Storage, New Nuclear Power Technologies, Maximising the Value of Recycled Materials and Low Carbon Technologies in Energy-Intensive Industries.

Akshay is eager to learn about how scientific research is used to better inform our legislators and is thoroughly looking forward to joining the POST team this summer. He commented; *'I am thrilled to have been awarded this year's Ashok Kumar Fellowship and I would like to thank the IChemE, NEPIC and POST for giving me this opportunity. I have always been interested in the inner workings of our parliamentary system and I am excited to see how parliament works first hand as an Ashok Kumar Fellow. While at POST, I will be responsible for researching and writing a POSTnote on a science and technology topic for Members of Parliament and Members of the House of Lords. POSTnotes help provide MPs and Lords with a balanced and unbiased analysis of the scientific evidence related to emerging technologies and concepts. I believe that the interdisciplinary nature of my undergraduate training in the Department of Chemical Engineering and Biotechnology will be invaluable in helping me assess information from various academic, industrial and governmental sources. I am really looking forward to working with the POST team and learning about how a diverse and complex range of STEM research is used to better inform parliamentary debate and scrutiny'.*

See TCE article www.tcetoday.com/latest%20news/2016/february/akshay-deshmukh-named-2016-ashok-kumar-fellow.aspx#.VvCGw_mLTIV

Do you want to write for an online feature for the University?
Cambridge University Development and Alumni Relations invite alumni to submit a piece of writing consisting of 800-1000 words on a topic of personal choice. The item will be featured as one of our "alumni stories," where alumni, fellows and academics can contribute and share personal stories. Topics are open, and pieces can be about the contributor's time in Cambridge, something that inspired them to follow their chosen career path, or a subject that they feel very strongly about. So if you're a budding writer or are keen to share your story, please email topics and/or submissions to contact@alumni.cam.ac.uk

Department Events

CEB Easter Career Talks: Thursday 12 May 2016 – *"Careers in the post-genomic Age for Engineers and Scientists"*

The last career talk in this series this academic year will be given by Bio Alumnus Dr Darrin M Disley, Entrepreneur, Angel Investor and CEO of Horizon Discovery Group Plc.

In healthcare, as the population of the world ages understanding the genetic "make-up" and thus "health" of nations is essential for effective social engineering and deploying of scarce resources and to solve the major challenges of the world like ageing populations, big data, clean energy, healthcare costs, economic growth, resource security and sustainability. This talk will outline the new healthcare paradigm and will identify opportunities that exist for engineers and scientists in the academic, not-for-profit and industrial sectors.

Open Days for Year 12/13 (sixth form students): 30 June- 1 July 2016 10am to 5pm
A chance to visit the Department before you apply to study here. Talks on Chemical Engineering and tours of the Department are available to prospective applicants during the two University Open Days. Booking is not required to visit the Department of Chemical Engineering and Biotechnology, but the University prefers it if visitors do book a place in advance to control numbers for some of the other events going on during the Open Days. If you are unable to make an Open Day, then you may be able to visit the Department at other times by appointment. Contact the Dr Patrick Barrie, Department (phone 01223 334777) to make arrangements.

CEB Public Engagement Success at Science Festival
Chemical Engineering and Biotechnology took part in the annual Science Festival 12-13 March 2016, thanks to a fun and enthusiastic bunch of CEB volunteers from the ranks of academic and support staff, postdocs and PhD students, who agreed to trade their weekend in for two days of full-on science sharing with the general public.

CEB had an info stand in the Astra Zeneca Marquee located on the grounds of Plant Sciences Department. CEB brief was to focus on one specific research aspect: "Future of Materials: Nano, Spores and Biomechanical".

There was a nano-card making and design station for children, who used real silver and gold stained polymer for decoration. This activity raised huge interest and CEB's was the busiest stand attracting mist visitors, as conformed by event organisers. More than 1500 visitors visited over the course of the science-packed weekend. The smiles on children faces and the dedication given to the task was priceless! PhD students and academics at hand told children, their parents and grandparents the basics of silver and golden nanoparticles. Volunteers, in turn, enjoyed being asked very intelligent questions and shared lab stories with the very inquisitive children there who enjoyed being scientists for the day. Sensor CDT lecturers also showcased their pulse measuring sensor. There were 3D prints of the spores, a microscope for kids (and adults) to look beyond what the eye can see.

See more on www.ceb.cam.ac.uk/about/science-festival www.ceb.cam.ac.uk/news/news-list/ceb-sf2016

ChemEng Running in the Family: Like Father, Like Son

Peter and Stephen Gerrard on the roof of King's College

Peter Gerrard 1956 – 1958. I joined the department in 1956, after Pt I of Natural Sciences. In those days most undergraduate courses finished with a BA after 3 years but ChemEng was a 2 year course starting after Part I, with a BA being awarded at the end of its first year and (until recently) nothing else thereafter. The department was sited in temporary huts in Tennis Court Road.

I attended lectures with about 20-25 others, all men in those days; I think there was just one female undergraduate in the whole of Cambridge engineering. In addition to departmental lectures, those of us who had come via natural sciences were required to take parts of the courses in general engineering, whilst the engineers (a small minority) had to learn some chemistry. The Head of Department was Professor Terence Fox and I can remember his lectures included the sort of mathematical equations I had hoped to leave behind in natural sciences. There was also of course Dr John Davidson, who introduced himself by inviting us all round to his house for sherry.

At the end of the first year we took the papers of the "Qualifying Examination", gained our BAs, and then had to learn how to ride a bicycle after dark whist wearing the long BA gown, gowns being obligatory at that time. The course included projects, firstly a literature search on a topic chosen by our supervisor, and secondly a simple experimental project done in pairs.

In our final year various companies came seeking new recruits, and in those happy days it seemed we chose the company rather than the reverse. I was employed by ICI (now defunct) for 25 years, and my work included design, chemical plant management and corporate planning, with short periods in Spain and South Africa. Then followed an interesting, but very fraught, few years managing capital planning in the NHS, and a final intellectually rewarding period as Institute Safety Officer at UMIST.

Stephen Gerrard 2005 – 2014 contrasting to my father over 50 years before, I initially studied general engineering at Cambridge. He had encouraged me to consider ChemEng and actually I spent my second year on a one year exchange program at the Massachusetts Institute of Technology, Boston in ChemEng, which enabled me to return to Cambridge in time to enjoy the rigours of the third year design project on the New Museums site! I received a BA and a MEng after my fourth year at the Department with Dr Geoff Moggridge as my Director of Studies.

My time in Cambridge continued through to a PhD and Post Doc in ChemEng with a stint at the University of California Berkley during my PhD. My research focused on developing a drug delivery device for infants I invented, under the supervision of Professor Nigel Slater. I now work at the Bill and Melinda Gates Foundation, halfway through a two year Program Officer position in Seattle, funding, managing and leading initiatives developing drugs and drug delivery devices for applications in developing countries.

One of the joys on staying through undergrad to post-doc was that, the day after completing my PhD, I was allowed to walk on the grass at King's. The resigned look on the porters' faces on realising my new privileges after eight years at the college was quite an experience!

With ChemEng I was attracted by the variety and type of my Dad's work after university. ChemEng at Cambridge has allowed me to experience many different walks of life. I have had the opportunity to work in locations such as South Africa, the USA, Honduras and many other places, with experiences ranging from collecting user-feedback on biodigester technical designs in villages to working in Californian virology laboratories. My father had a varied and exciting career through ChemEng, and today's opportunities are even greater!

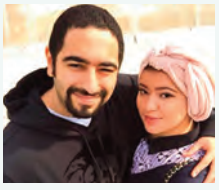
CEB Science and Parenthood

Before Birth

Noha Al-Otaibi

Our life consists of various personal, social and career obligations and options that we need to fulfill in parallel. It takes courage and effort to do it and to make the right decision at the right time. Therefore, I made the decision to be a mother while still doing my PhD, although many people think that it might hinder my academic progress. I also decided to ignore the negative voices and embrace the changes as I grow on daily basis. Personally, I believe pursuing an academic degree and having a child are equally important. And I consider myself a lucky person to be able to raise a baby and pursue my education at the same time. I know it is going to be a tough challenge; however, it is going to be worth it. At the moment I am learning about my personal ability and improving myself as needed to success both as a mother and PhD student. During my pregnancy I have been highly motivated and it was obvious that my baby is an incentive to be productive and I hope it will continue that way after the birth.

Hassan Alderazi



I am really excited to be a father, we discovered that we are having a baby last August and it is still as shocking to us today as the day we found out! It has been an amazing journey. Besides my research work, I try to dedicate time daily to learn about parenthood, and how to change diapers! As I run experiments in lab, I cannot help myself but think about how the baby is going to look like, the joy and laughter he will bring to the house. Yes, it is a HE.

The first 3 months of pregnancy were exciting but frightening at the same time. My wife had some complications with the pregnancy so I was checking my phone for a call every other minute in case of an emergency, which was very distracting from work and mentally exhausting. Things have calmed since but now the countdown to the delivery has started.

After Birth

Samson Aworinde

Ethan was born towards the end of my first PhD year. For the first few months, I worked my normal schedule, since both my wife and mother-in-law were around to look after him. However, when my mother-in-law left and my wife started a job, the first priority was getting a nursery place for the little one. We were lucky in the end to find a childminder to look after him Monday to Friday. As I drop him off and pick him up, my working hours became tighter and I try to fit in my experiments and other activities between these times. The positive thing is that this has made me incredibly organised, however the number of evenings I go out for a drink with the rest of my group or play football with CEB colleagues has shrunk considerably! I must acknowledge the incredible support and understanding of my supervisor, Professor Alexei Lapkin, which has been crucial to the progress of my research work so far. As you can imagine I'm filled with joy when I go home each day to a happy boy, especially when the day hasn't gone so well.

James Erickson

My daughter Julia was born on 20 May 2015, halfway through the 3rd year of my PhD. I am definitely enjoying being a father, though I will admit my wife who is on maternity leave is doing most of the hard work! I am writing up now, so the flexibility in working hours compared to a "real" job is very useful in parenthood, and living nearby the department is great as I can have lunch at home. It is refreshing to have something else to break up the total immersion of a PhD, and a baby's smile has got to be the best stress-reliever. Obviously it is not all easy and Julia's antics can be incredibly frustrating at times (especially if that time is 3am) but I can honestly say that raising a baby is more straightforward than doing a PhD!

Wearing different Hats each Day

Elena Gonzalez, PA to HoD, Marketing Assistant and CEB Focus Chief Editor

I have always been a bit hyperactive from the moment I entered this world back in 1976. I could not stay still for a minute and had a good reputation as the naughty child in the family. I was always a very curious, chatty and outspoken child, to the embarrassment of my own parents at times as I'd often blurt out what I thought at the most inconvenient times! My love of learning new languages quickly manifested too. However, it also came to light that maths and science were not one of my fortes (and here I am, working for Chemical Engineering and Biotechnology!).

I started my English Linguistics degree back home in 1997. I remember my Uni years being quite tough as I would often not sleep more than 4 hours a night - if 8 hours of lectures a day was not enough, then it would be exercises, reports, presentations, having to read a huge number of books overnight and the very regular exams, etc… The educational system back home was very much focused on learning theory with little emphasis on applying it. Many students would be far too dependent on teachers and not encouraged to make use of free thinking and to openly question and interpret facts. I was different … I liked analysing things and come to my own conclusions. I consider myself a free spirit always searching for new ventures and life experiences with a huge zest for learning new things. Other languages and cultures are of great appeal to me and I'd often wonder what living in different countries would be like. I absolutely adore travelling and I do as much of it as I can.

I visited England for the first time in 1997, and worked as a nanny in London for a couple of summers. When I graduated back home in 2000 I wasn't really certain as to what to do with my life, whether to get into teaching or translation so I came to England for some work and life experience and to brush up my English. Initially I thought I'd stay for a year and go back to Spain but 16 years later and I'm still here!

What have I been up to since? I have always had huge amounts of energy and friends would often say that there was no one in the world who'd be able to fit as many activities in one day as I'd be able to. Well, pretty much getting up to all sorts. I'm a great multitasker and I've always managed to juggle different things: I started off working in the hospitality industry and worked as events manager, on a couple of cool hotels and Colleges in Cambridge. I love flying and, as an interesting fact, I had a short spell training to be a *'trolley dolley',* and helping evacuate planes full of smoke in emergency situations! It was fun but the pay was quite low. During the same time I was at Anglia Ruskin doing teacher training part-time too. I eventually qualified to teach English to foreign people (CELTA). I did some on-to-one tutoring at home, whilst working full-time as events Manager.

It was back in 2006 that I decided I wanted to have a clean break and embark on pastures new. I managed to turn my CV around by doing IT courses, doing a Business and Admin NVQ and studying Marketing and then Communications with the Chartered Institute of Marketing (CIM). Because of my love of alternative therapies, I also trained as a professional massage therapist and I do practise it part-time along with aromatherapy.

Another passion of mine is music, combined with my flare in promotional activities, led me to work for a couple of music PR agencies in London over the course of two summers. I have also helped organise a charity music festival in Cambridge to raise funds for Oxfam and volunteered for community radio and presenting my own weekly radio show for 2 years. I may go back into it in the future if time allows!
I have great interest in matters of the mind and working with children too. I volunteer for CRUSE, a bereavement support charity helping the bereaved process the loss of their loved ones. I also volunteer for Woodcraft Folk as an after-school Youth Activity Co-ordinator, entertaining 5 to 8 year-old kids, whilst learning amazing lessons from them and having great fun in the process. There's so much out there in the world waiting to be explored. My own mottos: Life is an oyster. Time is precious. Work hard, play hard, learn and have fun in the process.

CEB Mentorship Scheme

The Office of Postdoctoral Affairs (OPdA) will officially be launching the mentoring scheme in June for all interested postdocs.

Some Chemical Engineering postdocs have already applied to the scheme. Academic mentors will be trained shortly so that matches can be made and mentees can also receive training. Matching a post-doc with a more seasoned investigator, who will offer advice and complement the relationships is the key. The post-doc has already developed within and outside the Department. Dr Linda Allan is one of the latest academics to join the pool of CEB mentors

Dr Linda Allan, MBE course director

Q1: Why did you become a mentor?

In my role as Academic Director of a Master's programme it is inevitable that careers guidance is one of the priority areas about which students approach me for advice. The Bioscience Enterprise course is a professional practice style course with much of the teaching delivered by industry professionals. Therefore, when designing the taught modules and negotiating for students' internship placements and consulting projects I necessarily spend a lot of time collaborating with life sciences business executives across the UK and further afield. Over the years I have built up a wide network in the sector and, with our 300 alumni acting as first rate ambassadors, I am often approached by companies who are looking to recruit graduate and postgraduate level employees. Word has spread that my office is a conduit for information about careers and in addition to my own students there are often visits from the department's PhD and business school students who come to me for advice, both about the generalities of the life sciences industry and also about where their skills would be best applied in a non-academic role.

Q2: What are key skills in a person who wants to become a mentor?

Knowledge, plus a willingness to meet more than once, even when time is pressing.

Q3: What do you think mentees get out of it?

For our own business Master's students, I would say they all benefit greatly from the network we have built up around the MBE programme. They frequently ask to be put in touch with alumni who are engaged in roles they aspire to, or to be recommended to companies where they plan to make speculative job applications. However many of the students I talk to who come from a pure research background have very little idea about the corporate world or how their skills can be transferred to a business role. It is often these people I can help most, through direct advice or by inviting them to take part in an appropriate lecture series on the Bioscience Enterprise course. For example, our enterprise, finance and market access courses have all been popular 'transferable skills training' for those transitioning to industry. For all the students an indication of what the industry salary norms are is also very useful information and I try to keep up to date across both consultancy and business roles.

Farewell to Professor Howard Chase

Professor John Davidson and Professor Howard Chase

Professor Chase joined the academic staff of the Department of Chemical Engineering as an Assistant Lecturer in 1984, became a Lecturer in 1986 and a Reader in Biochemical Engineering in 1996. He was the Head of the Department (HoD) of Chemical Engineering from 1998-2006 and has held the position of Professor of Biochemical Engineering here since 1 October 2000. He was also Head of The School of Technology from 2010-2013. A gathering was held at the department on 3 February 2016 to say farewell to Professor Howard Chase, who retired on 31 December 2015, after 34 years with the Department.

Farewell to Lyn Hurst

Lyn with research students

Lyn Hurst from the Accounts team left on 29 January 2016 after an almost 18 years' service in the department. A leaving party was held at Tennis Court Road and was attended by many of her current and past colleagues.

Long service

Vanessa Blake and Roz Williams have each now worked for the Department for 20 years. Michaela McNeill will have been with the Department for 21 years on 8 May.

Clare College Bridge

Clare Bridge's missing wedge

When sitting on the Banks, listening to the punters' tales, one might pick up some interesting stories. Whether these are true is not always clear. One of those stories could be about Clare Bridge.

This much-photographed bridge is actually the oldest of Cambridge's current bridges, built 1639-1640. Fourteen spherical stones decorate it, but upon a closer investigation one would notice that one ornament is missing a quarter sphere. A feature which is on almost all punting tours pointed out. An observant person on the Banks would discover three main explanations. The first story tells about the bridge's builder, who out of frustration for not having been paid in full, took his revenge by committing a small act of pretty vandalism. The second tale mentions a college fellow removing on purpose the quarter sphere to ensure another fellow could not win a bet with him as to how many spheres there are on the bridge. The final explanation blames Clare College for not wanting to pay a "bridge tax". Therefore, they deliberately left the sphere incomplete as in their opinion an unfinished bridge did not count.

Although these tales all have their charm, the reality is less exciting. The reason for the missing wedge is due to a weathered repair. As a result of corrosion of the sphere's fixing to the bridge, it became loose. In order to place the ornament back in its place, a segment was cut out. This allowed access to the fixing so it could be set in place with cement and the segment was replaced. They orientated the sphere with the cut facing outward so that it would be least noticeable to people crossing the bridge. However, through subsequent weathering of the cement, the segment detached from the rest of the sphere and fell into the river. On closer inspection, it can be noticed that a number of the other spheres have had similar repairs carried out, but their cut segments have remained attached.

'Cum Grano Salis' (With a little Grain of Salt)

Zlatko Saracevic, Senior Lab Technician in the Paste, Particle and Polymer Processing group and 'Amateur poet'

Zlatko's homeland: The famous Old Bridge over river Neretva in the city of Mostar, capital of Herzegovina ('Mostar' means bridge).

No man ever steps in the same river twice. This quote by Heraclitus is very much reflected in Do Fu's philosophy in the sense we know that everything must pass. Now, is this really true or does it really reflect the true statement about the term 'phenomena', known as 'causality'. Needless to say, the main reason is that the antique thinkers used the principle of certainty to develop these teachings. Nowadays , of course, we do know better than this, by simply applying the quantum principle of probability. Therefore, one can swim in the same river twice indeed as long as one repeats this attempt to swim in the same river. The probability of this event happening again is simply defined as a ratio or fraction of one (1)/ the number of whole bodies of water in the world, including the glass of juice you were drinking in Molly rainforest at Yunnan province last year. It does not matter how small the value of that fraction is, there is still a probability of that event happening again at one point in time. And, if for some reason, you don't fancy swimming in that river again, there is still a probability that you might drink the water from that river at one point in your lifetime. That is if the drop of rain consists of the water from the river you were swimming in, then the past drops in the glass of the pomegranate juice you were drinking at the time. It all depends on probability that you were drinking a particular glass of pomegranate juice at the right place at the right time, no more, no less. Quantum really works in mysterious ways, like a divine force to a certain extent.

CEB Teaching Consortium of Companies

For more information on the CEB Teaching Consortium visit www.ceb.cam.ac.uk/undergraduates/teaching-consortium

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