From the CM-CDT Director – Prof Ian Galbraith

This is my first opportunity to write something as the new Director of the CM-CDT. Mike Cates’ departure over the summer to take up the prestigious Lucasian Professor of Mathematics position at Cambridge led to vacancy which I’m delighted to be filling. We wish Mike well in his new role and thank him for the leadership and wisdom he has shared since the CDT was just an idea back in 2008. Other members of the Management Group have also moved on since the last newsletter; notably Sabrina Maniscalco has moved back to Finland. We have thus the opportunity to add a few new faces to the Management group, in particular Prof Martin Evans from Edinburgh and Dr Anne Pawsey, who as a graduate from cohort 1 can provide us with a unique perspective. I’m sure this refreshed team will continue to deliver a great experience to our graduate students.

Competition for places in the CM-CDT continues to be strong - as of June 2015 we have 14 new students enrolled to start in September. We have maintained a high threshold for acceptance of both UK and international students as a broad and strong cohort will engender the kind of rounded education we are committed to.

From the CM-CDT Operations Director - Dr Chris Hooley

The start of the renewed CM-CDT grant has brought quite a few changes with it this year. On the training side, we have three new taught courses, and this year also saw the start of a new system for progression assessment for CM-CDT students. All of our second-year students were asked to attend a poster event in the spring, at which they discussed the progress of their research with a panel of assessors. This event will now form an important part of the support we provide to our students as they transition from a partly taught-course environment into full-time research. Next year we will be incorporating this assessment session into the spring retreat, which will have the added benefit of allowing our other students to see what the second-years are up to!

Various other changes are taking place as we complete the transition to the new grant, including the rationalisation of our events programme and the streamlining of our system for monitoring students’ academic, skills, outreach, and teaching achievements. As ever, these achievements are many fold: the past few months have seen the publication of 15 papers, in journals including Proc. Nat. Acad. Sci., Nature, Nature Physics, Nature Materials, and Phys. Rev. Lett.; outreach work by CM-CDT students includes the recent launch of a new student blog; and several of our students are undertaking or planning placements with our Industrial Associates in 2015. As ever, full details may be found at our web site: http://cm-cdt.supa.ac.uk/.

Recent CDT Outreach Events

Slime Making Workshop, National Science week, Craigmount High School
- by Jack Bartlett

As part of National Science Week CDT students ran a workshop titled 'Slime' in which pupils from Craigmount High School learnt about the properties of long chain polymers and utilised cross linking to create their own 'slime'. This demonstrated some of the fascinating properties of non-Newtonian fluids which, under low stress, will flow and stretch, but under high stress become hard and brittle. A short scientific introduction was proceeded by a simple fabrication procedure using PVA solution and borax, allowing the students to experience this phenomena first hand. An additional ten minutes was spent with older students taking general questions about science, our reasons for choosing science and our careers.
Family Fun Day at Kirkliston Primary School - by Katherine Rumble

CDT students were invited to run a stall at Kirkliston Primary school’s family fun day on the 23rd May. In addition to hands on learning about slime, (is it a solid or a liquid?) we made lava lamps using water, vegetable oil, Alka-Seltzer and a lot of glitter. This motivated discussion of density, immiscibility and the more traditional phases of matter, liquids and gases. Oobleck (a mixture of cornflour and water) was as ever popular for demonstrating some of the fascinating properties of non-Newtonian fluids which can behave as both solids and liquids.

Glasgow Science Festival, 6th and 7th June, Kelvingrove Museum, Glasgow - by Katherine Rumble.

Our stall, run and organised by the CDT students themselves, was part of a larger event within Glasgow Science Festival. Children and adults alike were fascinated by the non-Newtonian properties of oobleck, awed by the dancing of oobleck on a speaker produced by sound with visitors stopping and asking “how do you make it do that”. Over the two days over 350 lava lamps delighted children, their parents and anyone who came close to the action. The biggest pull for getting the public interested, however, came from frequent and remarkably high-flying film-canister rocket launches.

Science Investigator badge for Brownies - by Charlotte de Grouchy

We were delighted to accept an invitation to help a group of Brownie girl guides to get their science investigator badge. For the activities, we set-up three tables, with a fourth run by another leader, with hands-on experiments for the Brownies to investigate. The Brownies were given 15 minutes to complete each experiment and so were taken on a speed tour of slime making, lava lamp making and rocket designing. As in the earlier outreach activities, good fun was had by all and we hope to have the opportunity to carry out a similar workshop with other Brownie groups in the future.

Industrial placement – Elliott Levi, placement at Biovia

By the end of my first year I knew I was interested in doing an industrial placement to give me an insight into other ways of progressing with my career. After seeing Biovia’s Dr Milman give a presentation at our 2014 careers event I was confident that they were the company I wanted to do my placement with and in the summer of 2015 I spent 6 weeks in Cambridge. I was looking for some experience in a scientific computer programming environment to see if shifting my focus away from the frontiers of research, to the implementation of it, was something I could envisage doing with my life. Although not directly related to my research I felt the work I did compliments the transferable skills I am acquiring throughout my PhD.

Biovia are a division of Dassault Systèmes with offices around the world. They maintain a portfolio of software products that provide scientific tools to carry out research and development and manage its progress in fields ranging from chemistry and pharmaceuticals to aerospace and automotive industry. In Cambridge the focus is on Materials Studio, a software package which brings together a large number of scientific computing codes with the aim of providing a multifunctional tool kit for materials modelling and simulation. It has components that can provide analysis of crystal structures, polymers and molecules, there are DFT components for energy calculations and predictive components for chemical, physical and electrical properties.

My task was to assess the feasibility of integrating a new component, that had features requested by customers, into Materials Studio. After some time spent going through tutorials and familiarising myself with the software I began to spend my days designing, testing and analysing computer code. The code I had written was performing as expected. However I had a set of results I was trying to reproduce using outputs from Materials Studio and ultimately I was not able to achieve this in the short time I was there. I was able to investigate several avenues for a cause or fix and leave a report to help the next person to attempt the problem.

There are subtle differences working in a company as opposed to researching in academia. I like the emphasis
on creating the solution to a problem that someone else will make use of. In academia as a researcher the emphasis is on making use of the solution. I would recommend that any student unsure about what they are interested in doing after their PhD make use of the DTC’s industrial associates program, be that to do research in a commercial setting or to obtain work experience in an unrelated field. It can give valuable insight into other options that are open to us through direct exposure and through networking with new colleagues. I feel that my time spent with Biovia gave me the experience I was looking for. I’m happy that I know how working in business will be different from working in academia. For more articles about student placements, see http://cm-cdt.supa.ac.uk/news_events/index.php

CM-CDT Retreat - Ana Fialho and Carolina Pereira
This year’s CM-CDT Retreat was held in April at the Crieff Hydro Hotel, with students from all cohorts attending three exciting days filled with group events. The retreat is intended to provide a relaxed environment for the students, promoting group events and networking. As such, the students were the ones responsible for the organisation of the program and all the activities.

Students were invited to suggest which academics should be invited, and after much discussion invited Prof. Ard Louis (Oxford University) and Prof. Rex Godby (University of York) to speak about Condensed Matter research topics relevant to the students’ PhD work. Prof. Louis presented his work and led a small discussion on the “Physics of self-assembly” using DNA to confer specificity to the bonds established between the particles/building blocks. Prof. Godby led a talk on the two major theories used to address the “the many-electron problem in quantum condensed-matter physics”, establishing the bridge between theory and experiments.

The retreat also provided a conference-like environment for the students to present their on-going work in a series of Student Seminars. In the field of Quantum Physics, Maximilian Schulz (University of St Andrews) and Artur Kaczmarczyk (Heriot-Watt University) talked about, respectively, “Quantum Quench of Cold Atom Gas in an optical lattice” and “2D crystals - materials for quantum photonics”. Lishan Zhao (University of St Andrews) shared some experiences and lessons he learned as a PhD student on a talk entitled “Useful lessons from my PhD study”. In the second half of the talk, Lishan also presented his results on CeAuSb2. Duncan McCann (University of Edinburgh) closed the Seminar Series presenting his work on “Electrostatically doped superconductivity under Pressure”.

Not all the activities were science related. A number of students requested a session on mindfulness and a mindfulness workshop delivered by the sports psychologist, consultant and former Scottish cricketer Alastair Storie. There, they learned that by becoming aware of what’s happening around them and with them (their own body, feelings and thoughts), they would more easily identify causes of stress. We were very lucky with the weather, which allowed lots of outdoor leisure activities. These included group walks, archery, a challenge activity which included a mix of outdoor games, and also a student organised rally/treasure hunt through the town of Crieff.

Many thanks to the students who helped organise these three days and to those who volunteered for the student seminars. A special thanks is also due to the invited speakers for sharing their work with us and to all the participants for their enthusiasm during the event.

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