From the CM-CDT Director – Prof. Mike Cates

First and foremost, I’m pleased to report that the funding for the Centre was renewed and we will be welcoming 5 new cohorts of students between 2014-2019. Many thanks to all of our staff, students, and Industrial Associates for the work they put into making this happen.

Two features of the new grant are particularly notable. First, we expect to be admitting a larger annual cohort than hitherto: fifteen or sixteen students per year rather than the previous eleven or twelve. Second, because the funding comes partly from the universities we can consider a broader pool of applicants, from continental Europe and beyond, as well as continuing to recruit the brightest minds from the UK. Incidentally, we are now officially ‘An EPSRC Centre for Doctoral Training in Condensed Matter Physics’ and thus in the process of changing our name and logo from CM-DTC to CM-CDT. For the moment, both titles are being used interchangeably - as you can see above!

We were also successful more recently in bidding for money from the EPSRC for capital equipment. This will provide a new computer cluster and a student workshop in Edinburgh, a picosecond event timer in Heriot-Watt, and an atomic layer deposition machine in St Andrews. The first two items will directly benefit student training, building on a mechanical workshop course delivered at Heriot Watt and a new Computation Materials course. In that context we are particularly grateful to our IA, Biovia (formerly Accelrys) for providing Material’s Studio software that will be used by our students. The other two items will benefit a number of student research projects. Thank you to all colleagues who helped to get that bid together at such short notice over the summer.

From the CM-CDT Operations Director – Dr Chris Hooley

The renewed CM-DTC grant brings various additions to our programme of courses: new academic courses on Surface Probes of Condensed Matter, Topology in Condensed Matter Physics, and Computational Materials Physics; an agreement to make some Edinburgh Business School courses available to our students; and new workshop training at Heriot-Watt for our students of experimental physics.

Whilst going through all the processes necessary for renewal, we have also continued our ‘business-as-usual’ activities. These have included the third CM-DTC summer school, on the topic of “Condensed Matter Physics and Quantum Information”, which was held in September at the Macdonald Highland Resort in Aviemore, and was attended by most of our students plus a select group of external participants. The lectures covered a mix of theoretical and experimental topics, from matrix product states to superconducting qubits and lots of things in between! This was a great induction event for our new cohort, giving them a chance to see CM-DTC doing what it does best. My thanks to all the lecturers and postdoc tutors for generously volunteering their time, and again to Christine and Julie for handling the organisation superbly.

Meanwhile, our students continue to go from strength to strength. Their names appear on recent publications in Science, Nature, PNAS, and PRL, as well as many other reputable journals. Outreach continues to shine as outlined in the students’ article below. Linked with this work many of our students have now been trained as STEM Ambassadors. Take-up for placements with our Industrial Associates is also increasing. As well as in the articles below, further details of all of this, and much more, are available on our web site (http://cm-dtc.supa.ac.uk).

Outreach – Student Outreach coordinators

The outreach teams at each of the Universities have been busy on a number of fronts with several outreach
activities recently completed and a number in planning. The Heriot-Watt outreach team have been busy constructing a blog (at [https://cmdtc.wordpress.com/](https://cmdtc.wordpress.com/)) and are now inviting article submissions from CDT students. Volunteers from St Andrews, Edinburgh and Heriot-Watt took part in a range of engaging physics demonstrations for the Dundee Science Festival. Steven Thomson and Philip Ireland were involved in a show titled “How cold is really cold?”, with four 30-minute sessions each using dry ice and liquid nitrogen to demonstrate various interesting phenomena that occur at extremely low temperatures. These shows were very well received, with the demonstration of the superconductor hovering in mid-air above a magnetic track greeted with amazed faces from the audience. After each of the shows, members of the audience could then come to get a closer look at some of the demonstrations. Our evening “Meet the physicists” event was aimed at offering an adult audience a chance to discuss scientific ideas in an informal atmosphere. We had questions on everything from lasers to string theory!

The Edinburgh outreach team was invited to lead a group of Brownie Girl Guides to help them complete their “Science Investigators” badge. The badge requires the girls, aged 7-10 years, to carry out a number of scientific experiments on different major themes, such as travel, the world around us and health. The Edinburgh group set up four challenges that involved designing and building rockets, discovering where lava in volcanoes comes from and how different materials act as both solids and liquids. The Brownies loved all the hands-on activities and the Edinburgh outreach group has since been invited to run similar nights elsewhere in the city.

A number of DTC students took part in the International Year of Light launch at the Royal Society of Edinburgh on the 23rd of February. Open to both school children and the general public, the event was aimed at providing numerous visual demonstrations celebrating the contribution of light to many scientific advances. Specifically, the University of St Andrews, in collaboration with the University of Strathclyde, built a portable Magneto-Optical Trap (MOT) that was taken to the event, allowing people to actually see a cloud of cold atoms with the aid of a camera. Feedback from the event was very positive and people were generally keen to ask further questions about the underlying physics.

We have also produced a five minute animated video aimed at explaining the scientific method to a general audience entitled “What do scientists do? And why?” This was funded by a grant from the Institute of Physics in Scotland’s Public Engagement Scheme. View at: [https://www.youtube.com/watch?v=Cmf6GgjmHmU&feature=youtu.be](https://www.youtube.com/watch?v=Cmf6GgjmHmU&feature=youtu.be).

**CM-DTC/Max Planck Collaboration – Dan Brodsky (student)**

The collaboration with the Max Planck Institute for Chemical Physics of Solids in Dresden, Germany is an exciting recent development for the CM-DTC, giving several students the opportunity to carry out their research in the Dresden facilities. Research at the institute in Dresden is mainly concerned with the study of material properties, working at the boundary between solid state chemistry and condensed matter physics. There is therefore a lot of overlap between the work carried out in Dresden, and that by students in the CM-DTC. So far the collaboration has lead to three workshops where students and researchers from Dresden and St Andrews have come together to discuss their work and exchange ideas. Another important and very useful facet of the collaboration is the sharing of equipment between the two sites, allowing CM-DTC students to work in the Institute's labs, and use equipment that they do not have access to at their home institution. In fact, several current projects within the CM-DTC are based jointly in Scotland and Dresden, taking advantage of the research
strengths of both institutions and giving students experience with a wide range of experimental tools. The opening of a new clean-room later this year in Dresden, with equipment aimed at the fabrication and study of mesoscopic samples, will further broaden the possibilities available.

**Industrial placement – Calum Lithgow (student)**

Approaching the final year of my PhD program I found myself having to seriously consider the classic question that every postgraduate student must eventually answer: continue in academia or pursue another career? The difficulty in reaching a definite conclusion was that I had very little experience of professional, scientifically-oriented work outside of academia. To find out more I undertook a short placement with an experience-expanding company, in order to see how a non-academic career might suit me.

This took the form of a 3 month break from my PhD research to do an internship with Siemens technology Accelerator (STA), based in Munich, Germany. Siemens undertakes a lot of research and development into new technologies, some of which do not lead directly to a Siemens product but are still very valuable and present opportunities for applications outside of Siemens’ core business. During my placements I worked with many people who have a PhD in physics or engineering and the atmosphere at STA actually felt very academic, with everyone reading scientific papers and discussing the results. The most obvious difference from academia however was the much wider range of scientific disciplines and technologies encountered and the faster pace at which the projects moved. In the 3 months of my placement I worked on 6 different projects in entirely different subject areas. There was also a very high importance placed on communication and presenting your newly-acquired knowledge clearly to others in the department. Learning to meet the high standards expected for STA presentations, and developing those kinds of transferrable skills in general, will be very useful for my work back in academia and a strong reason why I would recommend taking a short work-experience placement to my fellow PhD students. As for what career I will pursue, I now have a better feel for how my scientific training would fit into at least one area of industry and will look at both academic and industrial opportunities.

**CM-DTC Industrial Associates Careers event**

On 28 and 29 April 2014 the third CM-DTC Industrial Associates Careers Event was held at the Merchants’ Hall, Edinburgh, attended by 77 delegates. Presentations were made by IAs from Marks & Clerk, Siemens Technology Accelerator, Fluid Gravity Engineering Ltd and Nanovation on the first day along with 5 student research presentations. The latter were a new addition suggested by the students and were very well received in the feedback from the IAs. On the second day presentations were given by IAs from Mondelez International, Accelrys Ltd (now Bovia), Solvay and Oxford Instruments. The students had also requested coverage of careers in academia. To this end a presentation called “Careers Direction after your PhD” was given by Kirsten Roche from the Edinburgh University careers advisory service followed by presentations from academics at different stages in their careers. A round table question and answer session completed the event, with the academic speakers and Sharon Maguire (Edinburgh) and another careers advisor, Ben Carter (St Andrews) on the panel. Dr Ian Osborne, Science and Dr Joerg Heber, Nature Publishing Group judged the poster competition, won by Calum Lithgow (Edinburgh / St Andrews).

**Recent publications by DTC students**

Our students have authored over 11 publications in the last 12 months. Full list at http://cm-dtc.supa.ac.uk/research/publications.php

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