CM-CDT Newsletter No. 8
September 2016

From the CM-CDT Director – Prof Ian Galbraith
Welcome to the latest issue of our newsletter. This year has been one of some change and some evolution as outlined below. We have recruited the 8th cohort of CM-CDT students, maintaining the high calibre of our student body as well as adding several new supervisors and Industrial Associates to the team. In recognition of the importance of the student experience we are delighted to welcome Dr Anne Pawsey to the International Advisory Board. Anne is herself a graduate of the CM-CDT, with a students-eye view of all things CM-CDT and I’m sure her insights will make for a better CM-CDT for all of us. The IAB, for those who aren’t aware, is an external group led by Prof Peter Littlewood, the Director of Argonne Natl. Labs in the USA, which scrutinize us annually to make sure we are performing at a level competitive with the best in the world.

It may surprise you to hear that as we have now recruited our third of five cohorts since the renewal. Our thoughts are already turning to what shape the CM-CDT should take in the future when the call comes out from EPSRC for a further round of CDT funding. We are often asked to provide instances where the CDT model provides additional benefit to students over and above a standard studentship, so if you have some ammunition for us to use please let us know. One example of this is collaboration between CDTs in cognate areas, and we have one example of this coming up soon with a joint Magnetism/Superconductivity workshop in Bristol hosted alongside their Condensed Matter CDT. We look forward to this and other new ventures in the coming year.

Thanks go to Phil King for standing in for the Director of Operations position for the past year. Also to Jonathan Keeling for his work as Director of Postgraduate Studies and CM-CDT Recruitment Co-ordinator and Brendon Lovett who was responsible for the intake interviews and progress/special circumstances representative. Chris Hooley will be resuming his post in September.

Our CDT Manager, Mrs Christine Edwards, retired at the end of March 2016. Christine had been with us from the CM-CDT’s inception and played a pivotal role in setting up the centre and shaping how it operates today.

Dr Julie Massey has now stepped into Christine’s shoes as CM-CDT Manager and Mrs Wendy Clark started as Information Technologist/Administrator at the beginning of July. Their contact addresses are

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From the CM-CDT Operations Director - Dr Phil King
With the new CM-CDT grant now in full swing, we continue to review and update our operations, which I am pleased to update you on while Chris Hooley is finishing a well-deserved sabbatical year to concentrate on his research. Our total cohort now stands at just over 60 students, with another 16 joining at the start of the new term. This year saw a combined retreat and second-year poster and assessment session at Crieff Hydro in April which provided an opportunity for all of our students to get to know each other better as well as to learn more about the extraordinary breadth and quality of research going on in the centre.
Lively student talks at Crieff Hydro by Artem Strashko, Veronika Sunko, and Charlotte De Grouchy were complemented by guest lectures from Prof. David Lidzey, (Sheffield) and Prof Chris Pickard (Cambridge) and a number of social activities including quizzes and a treasure hunt.

Our outreach programme remains as active as ever, with the publication of a new edition of the outreach magazine (see Justin Whitehouse’s article below), progress on the outreach blog, and a varied programme of local events including schools and science fairs. I thank all of our Outreach co-ordinators for their dynamic direction of this effort.

Training in the use high-performance computing and of workshop equipment proved popular. The latter feeds into the use of our new CM-CDT student workshop established as part of a grant for capital equipment funded by EPSRC, which is also supporting training and research across the centre in areas from computational materials physics to organic electronics to quantum technology. Over the summer months, SUPA has been busy updating the installations in the SUPA VC rooms in Scotland, which will be up and running and available for lectures in the new semester. Our students continue to make ever stronger links with UK and international central facilities and our research partners, including linked studentships and attendance at training courses. Several students have recently undertaken industrial placements, or will soon do so, in occupations ranging from teaching to materials design to scientific publishing.

On 8 and 9 September 2015 the fourth CM-CDT Industrial Associates Careers Event was held at the King Khalid Building, Surgeon’s Hall, Edinburgh, attended by 95 delegates. This included six members of the CM-CDT Cohort 1 who graduated in 2013 and gave short presentations on the transition from their PhDs to their new careers, which include industry, academia and founding a start-up company (see Drs Alex Ward and Jack Barraclough’s article below). The main event was a networking event in which the students mingled in small groups with our Industrial Associates. A big thank you is owed to the representatives from 17 of our Industrial Associates who made this such a success. The event also benefitted from presentations by Nick Hood from the Institute of Education (University of Edinburgh) and Dr Jamie Douglas and Dr Christina Stewart from the Royal Infirmary of Edinburgh.

We’re delighted to acknowledge continuing support from SUPA for our Industrial placement scheme. This very welcome support will enable more of our students to take up placements of between 6 weeks and 3 months with our Industrial Associates and other companies where placements are available.

Finally, thank you to everyone who contributed to the Advisory Board Meeting in June, especially the students who came along and presented posters. The board were very impressed by our research and how well the students communicated this. All the while, our students continue to publish their research work in leading international journals, and to have it highlighted in the scientific and popular press. Further details on all of our activities can be found in the newsletter below, and at http://cm-cdt.supa.ac.uk

**Future Dates:**

**Industrial Associates Event** (TBC 25-26th April 2017)/ 18 Month Assessment (TBC 24-25th April 2017)

**CM-CDT Summer School 2017** This will focus on soft matter and take place from 26th August to 2nd September (inc) 2017 at the Byre Theatre, Abbey Walk, St Andrews. More details will be sent nearer the time.
Editing the CM-CDT Outreach Magazine – Justin Whitehouse

It is safe to say that when I volunteered to be the co-editor of the Outreach Magazine, I had no idea what I was getting into. It’s now two years later and a lot has happened since: I gained my PhD, and we produced four magazines instead of just one!

The brief was to produce a magazine describing the kinds of research the CM-CDT students are carrying out as part of their PhDs at a level that is accessible to school students who are completing their Highers, A-Levels or equivalent, and thinking about going to university. Our plan is to distribute them free to parents and students at some of our outreach events, with the aim that the magazine will help to encourage young people to choose to study physics at university.

This has been a challenging but ultimately rewarding experience. From the outset, we were pretty much learning how to produce a magazine as we went along, with a lot of help and advice for our previous editor, Alex Ward.

Some of the trickiest things to manage throughout the whole project were the deadlines for the contributors, but everyone did so voluntarily, finding time alongside their own busy research schedules to write the articles. I was actually very fortunate that all the contributors responded very positively to my requests for action and material, and were always willing to help out at short notice. I also learnt some tough lessons about organising large numbers of files of different types from many different people, and I definitely think here my inexperience showed. If I were to do it all again, I would do a few things differently to make the editing process a lot more manageable!

Our experience also showed when designing and formatting the magazines themselves. I was very lucky that Artur Kaczmarczyk volunteered to take on the role of designing the layout and formatting of the magazine.

We realised also that we actually had too much material and the magazine was just too big to print! This was a real testament to just how many CDT students wanted to contribute to the magazine, but provided us with a major, unexpected headache. The solution was to split what was intended to be one magazine into four, separate, themed magazines. The result is that now we have four issues on separate themes.

On a personal note, I think one very positive outcome has been that working together with many contributors from across the various sites has meant that I have been able to get to know better members of the CDT that I may not have otherwise worked with due to diverging research interests.

Myself and many of the other students involved with these issues of the magazine are moving on now, or soon, but I’m pleased to be able say that there is already some interest from the newest cohort of CM-CDT students in producing more Outreach magazines in the future. I hope they can build on the work we’ve done and the experience we’ve gained to continue publishing high-quality magazines, to continue to help persuade young people that physics is a really great degree to study at university.

Razorbill Instruments, a CM-CDT start-up – Drs Alex Ward and Jack Barraclough

In summer of 2014, two former students, Jack Barraclough (Cohort 1) and Alex Ward (Cohort 2) successfully completed their theses and joined forces with Clifford Hicks (a former St Andrews Post-doc) to work on commercialising an idea that had arisen from their research. Within 3 months, they had been awarded an Enterprise Fellowship from the Royal Society of Edinburgh, were conferred a grant to part-fund their £130,000 R&D project, achieved 3rd place in Scotland’s largest business competition and had incorporated a limited liability company; Razorbill Instruments. After almost a year of planning suddenly the start-up felt alarmingly ‘real’.
The company was founded to develop a new concept for a cryogenic nanopositioner (a precise linear motor that can operate at temperatures below 1 kelvin). This kind of tool is familiar to many operating in hard condensed matter physics and the company’s goal was to bring a design to market that would allow higher forces and greater reliability to these research tools than is currently available.

Quite quickly things became more complicated as, responding to the business training they’d received, Alex and Jack developed a more commercial mind-set and took a necessary ‘step back’ reviewing their original market proposition. They recognised that technical development of the proposed product and the maturity of the currently available products meant that costs would be higher than anticipated, requiring significant investment. To get investment they would need to show a credible route to sell into larger markets (beyond cryogenic research) but without a product developed such a narrative would be a very hard sell. What they needed was a simpler product, with less of an established competitor, which they could get to market quickly and would mesh well with pre-existing expertise. Unless they brought in some early revenue to support their R&D they were quite quickly going to hit the buffers. A radical plan was required. It was decided to focus development on a different product, a cryogenic strain cell, also a research tool, but this time one which allows researchers to apply controlled stresses and strains at low-temperature. There is no other such tool on the market and the team already had a great deal of experience building these – Clifford Hicks’ recent research involved this very type of strain experiment. The product was designed and built within a few months and since the product launch in November 2015, the product has been selling well, with orders being placed from a wide range of prestigious US and European research institutions.

Alex is optimistic for the future; “taking a second look at our plans and throwing our efforts into turning out a product that there was a clear and pressing need in the market for gave us an opportunity to grow the company while at the same time investing time and effort into bringing our more valuable (though more technically challenging) products to market.” The team have a few more surprises in the pipeline too. On future products, Alex said “One unexpected outcome of our R&D work so far has been the development of a completely novel concept for a flexible, high performance, nanofabricated position sensor. The sensor could have some huge mass-market applications in providing position feedback in the wide range of precise robotic motion that makes up modern manufacturing.” With revenue already coming in, some exciting products, with huge potential in the pipeline, Alex and Jack are proving that a CM-CDT PhD can be a solid foundation for a more unconventional career trajectory.

**Postdoc Musings – Steven Thomson**

At some point during your time with the CDT, eventually you’ll have to start thinking about what you want to do when you leave. As someone who’s just gone through the process of trying to find a postdoc, here are a few tips I wish I’d known when I started.

Whether or not you plan on staying in academia, it pays to be aware of your options as soon as possible. Many annual fellowships aimed at newly-fledged PhD students have start dates around October, but some of those can have application deadlines over a year before the start of the position. Some industry schemes can have similarly early deadlines – they’re not all like this, but make yourself aware of your options in plenty of time.

Talking of time, preparing applications takes far more of it than you might expect. Every place you apply to will undoubtedly want a slightly different document in a slightly different format. Learn how the game is played - talk to people who’ve played it before, get as much advice from as many people as possible and make your network of contacts work for you. Choose your referees carefully for each position based on which of your available pool of referees are likely to have the most clout with the department/group/company you’re applying to. Your contacts can help open doors that would otherwise be shut to you – that’s what they’re there for! It’s also helpful to open an informal dialogue with prospective employers before sending a formal application. It’s good to break the ice and if they remember your name from an interesting and promising conversation, it’ll make your application stand out from the crowd.
The most important thing I found from my experience is that it’s essential to communicate how you would fit into the department/group/company you’re applying to and what skills you’ll be bringing them that they don’t already have and that they won’t find in anyone else. It’s no use telling them how great you are and how vitally important your work is – every applicant will say that. If you want them to sit up and pay attention, make sure to convey to your prospective employer how hiring you will benefit them.

Ultimately, these tips are based on my own experiences and your mileage may vary but whether you choose to continue in academia or seek your future in industry, with any luck some of these points will help your eventual search for employment to go smoothly!