

Heart of droplets

Above is an image of an emulsion formed from octanol, water and self-assembled vesicles from a triblock copolymer. This vesicle is able to stabilise both water-in-oil and oil-in-water droplets as seen in this confocal fluorescence micrograph. Here water has been dyed with fluorescein. The vesicles were kindly supplied by Armes and Mable.⁽¹⁾ This image has been kindly supplied by Laura Sawiak (cohort 1) from The University of Edinburgh.

(1) Chem Sci. 2015 Nov 1; 6(11), 6179:6188.

News from the Management Board: SOFI² CDT Successful in Funding Application!

SOFI² press release article

Colin Bain - SOFI CDT Director

The Centre for Doctoral Training in Soft Matter for Formulation and Industrial Innovation (SOFI² CDT) - the successor to the EPSRC Centre for Doctoral Training in Soft Matter and Functional Interfaces (SOFI) will, thanks to a £5.3 million grant from EPSRC, continue to provide industrially integrated, postgraduate training in research, enterprise and innovation for future leaders in the soft matter academic and industrial sectors.

At least 80 PhD students across 5 annual cohorts will carry out research into topics as varied as smart surfaces, recyclable plastics and new medicines as well as learning about all aspects of soft matter through team-working on challenges set by industry partners. Science training will be complemented by extensive skills training in areas such as public communication and business awareness via an accredited mini-MBA.

SOFI² CDT, like SOFI CDT is joint programme with the Universities of Leeds and Edinburgh, alongside 25 industry partners such as Croda, Nestlé and Procter & Gamble.

Professor Colin Bain, Director of SOFI² CDT at Durham University, said: *"This is a great opportunity for students who want to expand our understanding of complex materials, but who also want to work on real-life applications. The exciting all-round training programme will prepare them for a career in business or academia. Our students will work closely with industry partners on their research and go on to work in high-skilled jobs across many industrial sectors."*

David Moore, Research & Development Lead for Skin Health at GSK, commented: *"I am delighted that the SOFI programme is being extended and look forward to continuing our support and participation in this programme. The education and training of a new cohort of young scientists across all the scientific disciplines that underpin soft matter and interfacial science is critical to providing the industrial scientists of the future for companies, such as GSK, across all technical functions, including R&D and process science. Understanding the interactions of our formulations with interfaces is critical to the development of robust medicines and consumer products at GSK."*

SOFI Out and About

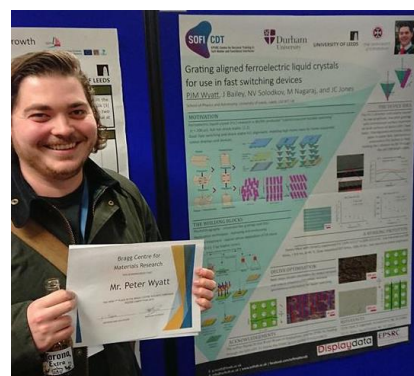
SOFI students have once again been travelling across the world presenting their research. Here are just a few conferences in which SOFI students have participated during the last few months. Click in the links for more information.

(This Christmas, Holly Linford (cohort 4), Rachel Goodband (cohort 4) and Sarah Goodband (cohort 4), went to the Bruker User Meeting and Conference in Coventry. At the event, Sarah won the prize for the best Christmas jumper (see photo) and Holly won most glamorous at the conference dinner.

Sophie Ayscough (cohort 3) presented a talk at ISIS Student User conference in Oxfordshire.

In January, Peter Wyatt presented a poster at the [Bragg Centre for Materials Research Symposium](#) and won 1st place in the poster competition. A number of SOFI academics also attended this symposium, including Brent Murray that gave a talk

Lorenzo Metilli (cohort 4), Holly Linford (cohort 4) and Denise Li (cohort 1) attended the IOP Physics in Food Manufacturing conference at Campden BRI.



Nestlé site visit

Charlotte Pugsley – Cohort 5

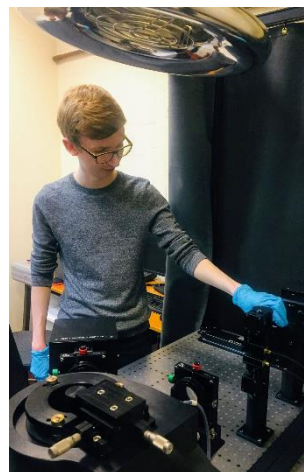
The SOFI cohort 5 trip to Nestlé in York was a really fun and interesting addition to our second case study, in which we were studying the science of ice cream. After a brief introduction to Nestlé we were given a tour of the factory floor. We were shown how the mass production of KitKat's works, with conveyor belts of heated waffle plates lined up to form the wafer portion of the chocolate bar. We



saw large machines with metal rollers, designed to mill the cocoa liquor to particular particle sizes. This is an important part of the process as the cocoa particles must be finely ground to prevent the chocolate from tasting gritty and giving a bad 'mouth-feel'. After the factory tour we were given a demonstration of KitKat's made by hand in their factory kitchen; taste testing their dark, milk, white and new Ruby chocolate – from a newly discovered cocoa bean with a distinct berry taste, despite having no added flavours or colours. It was here that we saw the importance of tempering chocolate which causes the production of seed crystals to give the desired crystalline phase with a higher melting point and prevents the formation of unfavourable fat 'bloom'. Seth and Kelly even got a chance to have a go at making some KitKat's of their own – see pictured. After our factory tours, we had several short lectures on the science of chocolate, cereal bars and sweets, with many samples to go with them. We learnt a lot about changing the characteristics of chocolate bars to make them more appealing to a larger, more health conscious, market, including reducing the calorie or sugar content of the confectionary. We heard about the benefits of increasing the amount of air with chocolate bars, which creates a creamier texture in the mouth (tested via preference testing), and also reduces the calories and sugar content. Having seen and tasted many of products on offer at Nestlé, we concluded our tour – thank you very much to Prof. Brent Murray for organising the trip and to Nestlé for hosting us!

Adam O'Connell

Hi, I'm Adam from Cohort 4. I'm at the University of Leeds developing microrheological techniques for the characterisation of phase separated materials, supervised by Johan



Mattsson in Physics, Mike Evans in Maths, and Julian Bent at Unilever. My undergraduate degree was Physics at the University of Oxford. I didn't get much exposure to soft matter, but my Master's project in the simulation of cellular monolayers (modelling them as active nematic lyotropic liquid crystals) gave me a taste of the field which I knew I wanted to follow up on. When I joined SOFI I expected to choose another computational project, but towards the end of the case studies I decided that a project with an experimental component would be more challenging for me and make me a stronger scientist in the end. It's definitely challenging, jury's still out on the second part! I'm a keen swing dancer, so outside of work it's a good bet that I'm tiring myself out on a parquet floor somewhere in Leeds doing lindy hop, collegiate shag, balboa, or charleston.



'The Hidden World of Crystals' - Festival of Creative Learning

Carmen Morcillo Pérez – Cohort 4

Each year, The University of Edinburgh celebrates the Festival of Creative Learning. For this edition, Carmen Morcillo Perez (cohort 4) and Waad Albawardi developed the outreach workshop 'The Hidden World of Crystals' at Ascus Lab.

It is mesmerising the world of crystals that lurks in surprising places around us. Attendants had the opportunity to create their own crystals and image them, whilst learning the science behind these beautiful compositions.

Find more information about the festival [here](#).

In the picture to the right, we can see Carmen during the workshop showing how Sunset Yellow (the orange colorant used in Irn Bru!) changes phase with concentration from liquid, to liquid crystal and then to crystal.



Matthew Litwinowicz

Hi, I'm Matt from Cohort 4. My undergraduate degree was in Natural Sciences in Chemistry and Physics at Durham. As part of SOFI, I have stayed in



Durham, although I enjoyed the opportunity to study at the other two institutions. I'm now working with Richard Thompson to look at surfactant in PDMS systems and the migration of molecules near the PDMS interface for marine fouling-release coatings. When I'm not working I enjoy calisthenics, video games and watching a whole Netflix series in a day.

International Soft Matter Conference

Ines Foidl – Conference Administrator

The 5th in a row of International Soft Matter Conferences (ISMC), held under the auspices of the [SoftComp Network of Excellence](#), will take place in Edinburgh, UK from 3-7 June 2019 and will host discussions on a wide range of Soft Matter topics. The main parts of the Conference will take place at McEwan Hall and Appleton Tower, in the central area of Edinburgh and will include 2 poster sessions.

Important Deadlines

22 February 2019: abstract submissions (talk & poster) will close

19 April 2019: early bird registrations will close

17 May 2019: late registrations will close

More information can be found on our website at www.ismc2019.ed.ac.uk or on www.twitter.com/ismc2019.



Richard Chilvers

Hi, I'm Richard from Cohort 4 and I studied Chemistry at the University of Nottingham. My Masters project



involved the synthesis of polymeric dispersants to be used in medical applications, this was my first introduction to the wonderful world of soft matter and it encouraged me to apply for a PhD with the SOFI CDT. Currently I am trying to make polymers to control the formation and stability of metal nanoparticles to be used in catalysis with Phil Dyer, Simon Beaumont and Lian Hutchings at the University of Durham. In my free time when I'm not sleeping I like to play euphonium and watch a lot of netflix."

Science snapshot - Ultrasonics in food

Lorenzo Metilli – Cohort 4

Hello, my name is Lorenzo and I'm doing my PhD in Leeds, in the school of Food Science and Nutrition. I'm part of the Food Colloids and Bioprocessing group, and my supervisor is Dr. Elena Simone. My project is focused on stabilizing edible oil foams with fat crystals (Figure 1), for designing novel foods products with lower caloric content, improved mouthfeel and texture.

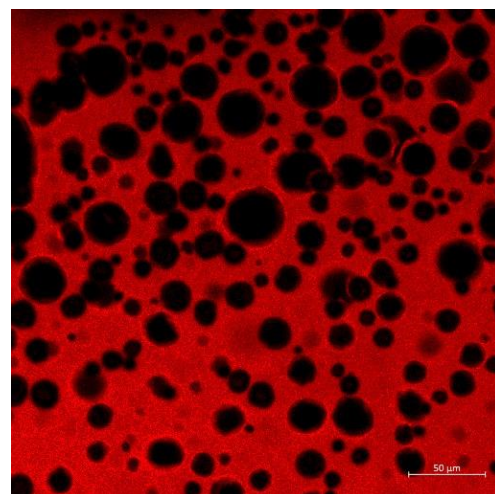
Aerated foods are common to everyday life, beer and wine, bread, whipped creams, and aerated chocolate bars are some examples. However, the complex relationship between the starting ingredients, the processing procedure and final products is not fully understood. This topic represents a challenge for scientists under several aspects and requires knowledge in physics, chemistry, engineering and food science.

Most of aerated foods are opaque, making optical techniques ineffective as a characterization method. Ultrasonic techniques, on the other hand, are a well-established alternative for investigating the properties of food materials, both in the laboratory and in industry. Ultrasounds pulses probe physical and mechanical properties of the analysed material, and present several advantages, like being non-destructive, non-invasive, fast, sensitive and cheaper than other techniques. Data interpretation is robust and straight-forward in most applications, thanks to calibration with standards.

Food foams display a high level of structural complexity, comprising a liquid phase, non-spherical air bubbles, and stabilizing particles. Furthermore, the continuous phase forms liquid channels and liquid films between adjacent bubbles, and the particles can form solid networks around and between different bubbles. The physical properties of those single elements differ largely among them, making foams a challenging material to characterize using standard analytical techniques.

Ultrasounds make no exception, as foams exhibit a non-trivial acoustic behaviour. All the above mentioned structural elements scatter the incoming pulse, altering its intensity, frequency and phase. Experimental data still require an exhaustive model to be interpreted properly.

A potential solution could be a multi-technique approach, in which internal structure data could be inferred from x-ray experiments. X ray tomography, for example, has been used already for imaging the internal structure of food systems such as ice cream and aerated cakes, without altering significantly the samples. Once enough knowledge of the internal structure of foams has been gathered, there could be an advance



See above a confocal microscopy image of an edible oil foam.

Inter CDT conference Durham

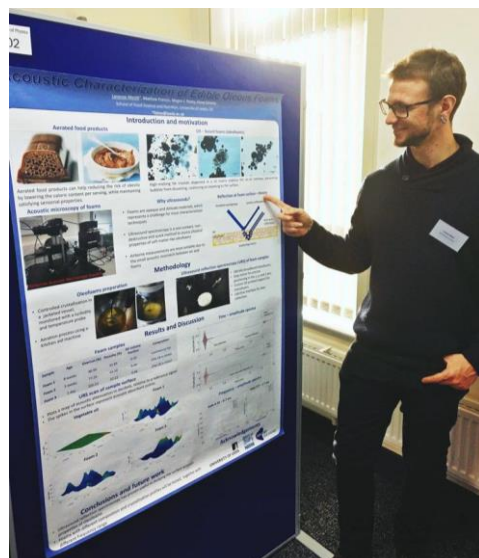
Sarah Goodband – Conference co-organiser

Second Inter-CDT Student Conference 2019 Durham 16th-17th December

This conference:

- Is student led
- Has a friendly and supportive atmosphere throughout
- Provides networking opportunities within and outside of SOFI
- Gives a chance to see how other CDTs function and gain insights into different research areas
- Will be a lot of fun!

We hope to see you there – more details to follow soon!



Lorenzo Metilli presenting his poster at the IOP in Food Manufacturing conference at Campden BRI.

Science snapshot – Structure and stability of phospholipid membranes found in dermatological formulations

Denise Li – Cohort 1

During my PhD I studied the nanostructure and thermal behaviour of phospholipids by using X-ray scattering and differential scanning calorimetry (DSC).

I started off looking at “simple” oil in water emulsions (wasn’t as simple as I thought!) to try to understand the interactions between a humectant and lipid. Humectants are used widely in skin creams for their “water attracting” nature which gives a pleasant sensory effect on the user. I was looking at how these molecules interact with a phospholipid, which is used as the main structural component of the formulation. Before I moved on to more complex formulations, I looked at how commercial lipids performed compared to higher purity

“research” lipids. Industry use commercially available lipids (I imagine for economical reasons) which are usually found as lipid mixtures with presence of impurities and so it is very useful to understand how these lipids behave compared to pure lipids. I also looked at multi-component formulations with more than three components which was more comparable to a final end product and compared the structure of these formulations compared to pure lipid.

The outcomes of my research can hopefully directly benefit my industrial sponsor through knowledge transfer, and the cosmetic industry in general; transforming formulation development from being an “art” to science.



See above a Picture of Denise and her viva examiners.

Annual SOFI Showcase conference in Leeds

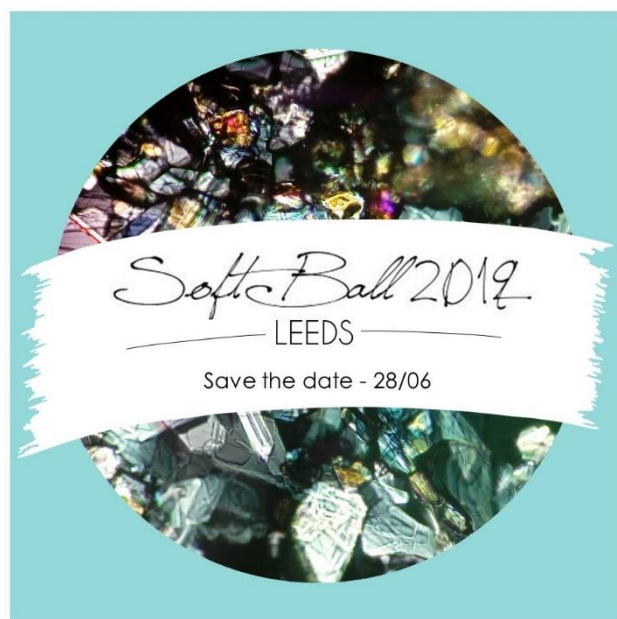
Brent Murray – Conference organiser

This SOFI Showcase 2019 will take place at the University of Leeds, on Thursday and Friday 27th and 28th of June 2019.

This time there will be a strong emphasis around on the work the current SOFI students have been doing; with opportunities for them to present verbally and/or as poster, plus speakers and attendees from industry. It is expected for all current SOFI students (i.e., cohorts 2 to 5) to attend.

The conference will be followed by the annual SoftBall on the Friday evening, which is a student-organized ball, this year led by Holly Linford, Adam O’Connell, Zachary Gradwell and Morfo Zembyla.

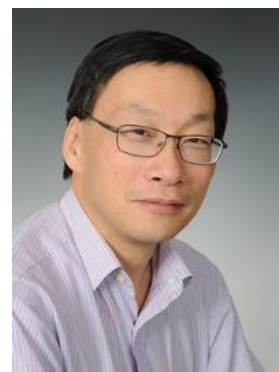
More information regarding registration and abstract submissions (talk and poster) will be available soon on the SOFI website www.dur.ac.uk/soft.matter/soficdt/events/



Thomas Graham Award for Prof Wilson Poon

From the Royal Society of Chemistry & the Society of Chemical Industry

Congratulations to Professor Wilson Poon who has been awarded the Thomas Graham Lecture, an award made for work in colloid science by the Royal Society of Chemistry & the Society of Chemical Industry. The Thomas Graham Lecture is a mid-career award for a researcher who has established an international reputation in colloid science and has made distinguished contributions in this field. The award is named after Scottish scientist Thomas Graham, who studied medicine in Edinburgh after having learnt chemistry in his native Glasgow. He is one of the founders of colloid science.



Prof Poon is internationally known for his work using 'model' colloids to study phenomena that are ubiquitous across condensed matter and statistical physics, particularly the structure and dynamics of arrested states such as glasses and gels. More recently, he has focussed on the flow of concentrated suspensions of bigger, granular particles, where the phenomenon of shear thickening is ubiquitous.

To industrial practitioners, such suspensions are widely known to be capricious and difficult to control. Professor Poon's work has helped bring about a revolution in understanding the flow of these suspensions, examples of which range from molten chocolate through ceramic pastes to concrete. This new understanding is now being applied to solve industrial problems such as improving the extrusion of catalytic converters for vehicles. In 2012, he set up the Edinburgh Complex Fluids Partnership (ECFP) to coordinate and facilitate collaborations with industry. To date ECFP has worked with more than 40 companies spread over a dozen sectors.

Continue reading the article [here](#) (from the School of Physics and Astronomy website, The University of Edinburgh).

Helen Gleeson: 'Outstanding Research Supervisor of the Year'

from THE Awards 2018

Congratulations to Helen Gleeson, Physics Professor and current Head of the School of Physics and Astronomy at the University of Leeds, for having won the [Times Higher Education 'Outstanding Research Supervisor of the Year' award](#). This award recognises her outstanding supervision and support of PhD students past and present.

Professor Gleeson previously worked at the University of Manchester, where she was the physics department's first female lecturer.

Testimonials for Professor Gleeson's nomination highlighted her involvement in improving the level of support at Leeds for students from a diverse range of backgrounds.

She spearheaded the creation of her department's postgraduate tutors groups for international students and for women, which give students access to a support network of academics who have faced similar situations and experiences. Since 1990, Professor Gleeson has supervised 31 PhD students, several of whom have gone on to work for world-leading technology companies or have become highly regarded academics leading their own research groups. Claire Honess, dean of Leeds Doctoral College, commended Professor Gleeson's "selfless" approach to ensuring that students' work is funded and supported, noting that her "sensitivity to the needs of postgraduate researchers...has inspired her to develop new PhD formats", including a four-year course aimed at making sciences more accessible to international researchers.

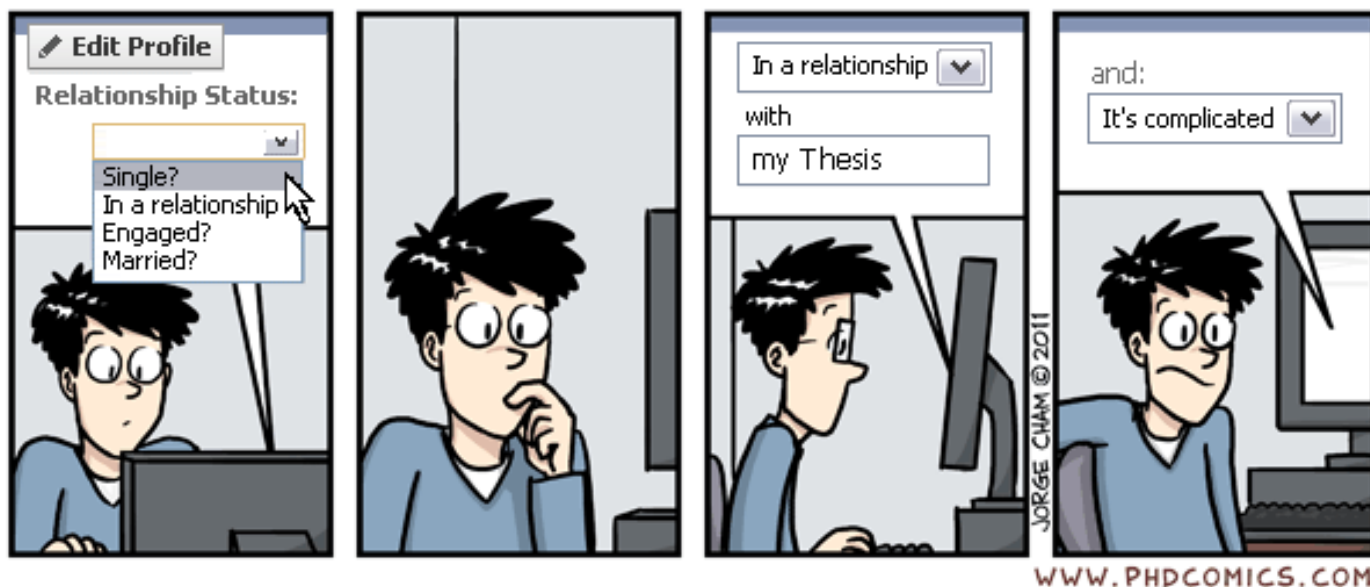
The judges said that Professor Gleeson's students "appreciated her mentoring approach, challenging and encouraging them to do things they could never have imagined while being constantly supportive before, during and after their PhD".

Continue reading the article [here](#) (from THE Awards 2018)



See above a picture of Helen Gleeson at **THE Awards 2018**.

PhD life comic



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Save the date

Take a look at some of the upcoming conferences and SOFI events

- 5th International Soft Matter Conference (3rd – 7th of June 2019, Edinburgh)
- Annual SOFI Showcase conference in Leeds (27th - 28th of June 2019, Leeds)
- Annual Soft Ball (28th of June 2019, Leeds)
- Inter CDT conference Durham (17th – 18th of September 2019, Durham)

Keep up with all the SOFI news online, find us on:



www.dur.ac.uk/soft.matter/soficdt/

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Instagram: instagram.com/sofi_cdt/

Feedback and submissions for future issues welcome!

Please contact C.Morcillo-Perez@sms.ed.ac.uk