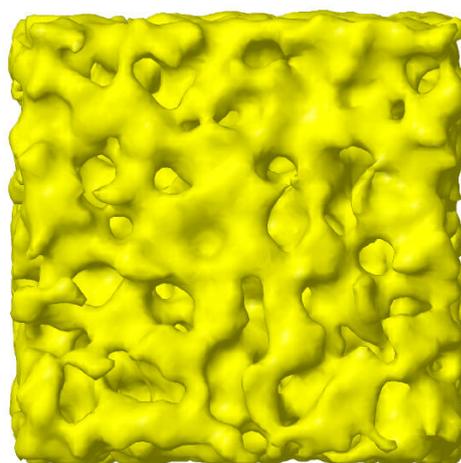
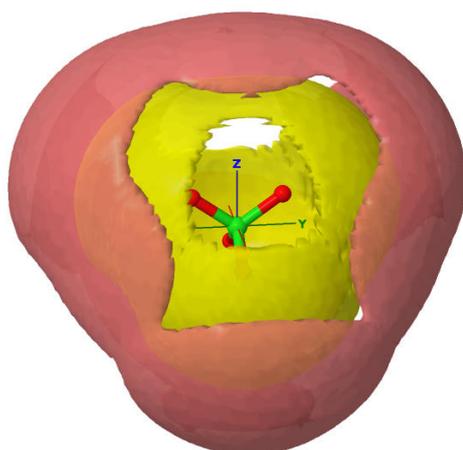


**Issue no. 10**



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*Highly compressed water structure observed in a perchlorate aqueous solution.*  
*LEFT: Distribution of water (yellow) and magnesium (red) around the perchlorate ion in*  
*Mg(ClO<sub>4</sub>)<sub>2</sub> aqueous solutions. RIGHT: Distribution of water in Mg(ClO<sub>4</sub>)<sub>2</sub> aqueous*  
*solutions. From: [Nature Communications 8, Article number: 919 \(2017\)](https://doi.org/10.1038/ncomms919)*

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See <http://www.iop.org/activity/groups/subject/lcf/> for further details

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## Group News

*Valeria Garbin, Secretary, Liquids and Complex Fluids Group*

2017 has been another busy year for the Liquids and Complex Fluids Group, as we have been involved in a number of events. We have organised the Advanced School in Soft Condensed Matter "Solutions in the Spring" at Durham University.

The Group has also supported the first Silk Conference, which was held in Sheffield.

I would like to take this opportunity to remind you that the group is able to organise meetings as well as provide sponsorship for meetings planned by external parties. Please get in touch if you have an idea for an event likely to be of interest to the community. Contact details of committee members can be found at the end of this Newsletter.

The 2017 LCFG Early Career Prize was awarded to Dr Lorenzo Di Michele. A report on the prize can be found on page 7.

Last but not least, in 2017 we welcomed to the Committee a new

student member, Tunrayo Adeleke-Larodo (University of Oxford).

## Chair's Address

*Tannie Liverpool, Chair, Liquids and Complex Fluids Group*

My first year as Chair of the Group has been a great opportunity to connect more with the community working on liquids and soft matter beyond the traditional frontiers of physics, from manufacturing, engineering to biology.

2017 has also seen an increased engagement of our Group with the wider international community, with the European consortium SoftComp supporting our Advanced School in Soft Condensed Matter for the first time.

This year, I am delighted to help Dr Anita Zeidler (Bath) organise the 2018 edition of our Advanced School, which will be held in Bristol from June 6-9<sup>th</sup>, just before the LCFG-sponsored conference "Unifying Concepts in Glass Physics VII", also in Bristol, from June 11-15<sup>th</sup>. The overlapping school and conference will provide

the community an excellent opportunity to learn about many fundamental new developments in the physics of liquids and complex fluids.

I wish you all a happy and productive 2018.

## Reports from previous events

### LCFG / PPG / STFC / Softcomp Advanced School in Soft Condensed Matter 2017: “Solutions in the Spring”

*Report by Margarita Staykova and  
Valeria Garbin (Organisers)*

The Advanced School in Soft Condensed Matter was held at Van Mildert College, Durham University, on 9<sup>th</sup>-12<sup>th</sup> April 2017. The event attracted 33 students from UK and Europe, who learnt about Colloids, Membranes, Biomolecules, Neutron Scattering and Disordered materials in three exciting days, packed with science and social activities.



*The 2017 edition of “Solutions in the Spring” was held in Durham.*

The school began on Sunday afternoon with an introductory

lecture by Tom McLeish, and the first lecture on Colloids by George Petekidis. The afternoon continued with a networking event, followed by dinner at Collingwood College and free time to socialise.

Monday was a full day, with lectures on Colloids (George Petekidis) and Macromolecules (Paola Carbone) until the early afternoon, followed by a visit to the city centre of Durham and an afternoon tea at the Castle. The School Dinner was also held on Monday.

The lectures on Tuesday focused on Neutron Scattering and Disordered Materials (Andrew Parnell) and on Membranes (Nick Brooks). The students presented their thesis work during the poster session on Tuesday afternoon. Awards for the best posters went to Maxime Schneider from Université Paris-Sud and to Adam Stones from the University of Oxford.

The event was organised by the LCFG with generous support of the Science and Technology Funding Council (STFC), the Polymer Physics Group of the IOP, and SoftComp.

### LCFG / EPSRC Silk Conference, Sheffield

*Report by Chris Holland  
(Organiser)*

Thanks to the generosity and support of the Liquids and Complex Fluids Group and EPSRC, over the

summer the UK had its first silk specific conference held in Sheffield.

The three-day conference held at Halifax Hall from the 24th-26th July brought together over 50 experts in the field of silk science and industry from around the world. This excellent turnout attested to the growing community of silk research across the UK (in particular early career researchers) and the overall enthusiasm and interest in such a meeting from those from near and afar.



*The participants of the 2017 Sheffield Silk Conference*

The intent was to generate scholarly discussion around the key challenges in the field and foster collaboration with the aim to give everyone an equal platform to showcase their science. Given silk is flow processed from a gel into one of the world's highest performing fibres, the topics discussed naturally centered around silk as a complex fluid, including protein structure and intermolecular interactions; characterisations in the liquid and solid states; processing methods and applications.

A full programme, abstracts booklet and details of the conference may be found at

[www.sheffieldsilkconference.co.uk](http://www.sheffieldsilkconference.co.uk)

and we are already planning the next meeting in Europe next year!

## **Reports from Early Career Researchers**

In 2017 our Group supported three Early Career Researchers with bursaries to attend international meetings. We are pleased to include two reports from these conferences, prepared by the Early Career Researchers in attendance.

### **2017 Annual European Rheology Conference**

*Report by Ewan Hemingway,  
University of Durham (Postdoc)*

I had the great pleasure of attending the 2017 Annual European Rheology conference in Copenhagen in April, organised by the Nordic Society of Rheology. The meeting drew together rheologists from a wide range of backgrounds, with the main themes including food/bio-rheology, suspensions, and flow instabilities to name but a few.

The first day saw a series of fascinating talks on non-Newtonian fluid instabilities. This started with a focus on extensional instabilities, including an intriguing helical extrusion instability that was observed in highly shear-thinning

fluids (Tristan Baumberger), and a theoretical study of the resonant behaviour that is seen when non-Newtonian fluids are extruded into fibres (Mathias Bechert). At larger length scales, we also heard of progress in understanding so-called “knuckling instabilities” that affect the production of pipes for transporting oil and gas. In the afternoon, Laura Casanellas showed some beautiful experiments measuring the transition from laminar flow to elastic turbulence in wormlike micelles, as the applied shear-rate was increased.

The theme of extensional instabilities continued through into Wednesday morning. This included an innovative study in which a surrounding bathing fluid was used to slow down the resulting “necking” instability of a Newtonian fluid, allowing previously inaccessible flow regimes to be studied. We were also shown results from an experimental technique (ROJER) that measures extensional properties by exploiting the tendency of free-falling viscoelastic jets to form a beads-on-a-string structure. These were followed by an impressive talk by Rob Poole that explored the relation between a polymer's properties and its effectiveness in reducing drag in turbulent flow. In the afternoon I attended a packed session on micro- and nano-fluidics, where Amy Shen presented recent experiments studying the flow of wormlike micelles past a cylinder which display an interesting

upstream instability that appears to be intimately linked to shear-banding instabilities.

There was no escaping the scientific atmosphere at the impressive conference dinner held at Langelinie, where we were rigorously told the precise temperature that the fish had been cooked at (48°C) and the complex osmotic process that led to “the most apple flavoured apple that you will ever taste”, which was met with nods of approval from the food scientists. Scanning the surrounding tables, I could also spot rheologists gleefully probing the response of an unusual, foam-like red berry sauce that accompanied the main course.

If any more evidence was needed for the prevalence of wormlike micelles as an essential experimental system, the brilliant plenary talk on the final day by Sandra Lerouge on shear-banding instabilities provided it. She showed how the interface between bands of differing shear-rate can become unstable leading to complex, three-dimensional structures. She warned that careful velocimetry is required in these cases, and that global quantities (e.g. the shear stress) and techniques that take 1D averages of the flow velocity both fail to capture the full story of such instabilities.

As someone who looks at flow instabilities in complex fluids from an analytical/numerical perspective, the meeting provided me with much

needed exposure to some of the experimental practicalities of rheology. When discussing recent work undertaken with collaborators in Durham, which suggested possible strategies for mitigating instability in rotational rheometry, it was interesting to hear just how difficult and sensitive some rheological experiments need to be. Discussions with those involved in rheometer design concerning the role of wetting in such instabilities will also help shape my future work in this area.

If there would be any criticism, it would be that there were too many excellent talks in my own subject area (non-Newtonian flow instabilities) making it difficult to fully explore the breadth of talks available - often I would find myself wanting to be in several sessions at once! Overall I found the meeting to be a great success however, and I will be eager to return when the meeting moves on to Sorrento in Italy in 2018.

### **8th International Discussion Meeting on Relaxations in Complex Systems**

*Report by Ling Wang, Queen Mary University of London (PhD Student)*

I attended the 8<sup>th</sup> International Discussion Meeting on Relaxations in Complex Systems (8IDMRCS) in Wisla, Poland on 23-28th July 2017. It was a very successful and well organised conference. Many world-leading experts attended and talked at this conference, including

Prof G. Ruocco, Prof T. Scopigno, Prof J. C. Dyre and more.

Particular highlights that I was interested in at this conference included the two sessions on Boson Peak, and Role of Temperature and Volume in the Dynamics of Liquids and Polymers. Both sessions had excellent speakers and very interesting topics. A talk by Dr Y. Zhang on acoustic excitations in liquids provided experimental results of longitudinal and transverse spectra by inelastic neutron scattering. This is particularly relevant to my experimental work on finding the gap on transverse phonon dispersion curves by inelastic X-ray scattering. Furthermore, the poster sessions were very valuable to discuss research in detail with the attendants.

I presented my work at this conference and received positive feedbacks from academics. It was encouraging to hear from academics that they thought my work was valuable and my topic was interesting. After my talk, Prof W. Wang and I had a discussion on collaboration on heat capacity of metallic glasses. Another big benefit I received from this conference was the opportunity to discuss my recent unpublished results with our long-standing collaborator and co-author Prof Vadim Brazhkin. My supervisor, Prof Brazhkin and I had very detailed discussions and we made progress on my PhD research.

The conference provided me with many opportunities for formal and informal networking. These in-depth discussions with world-leading experts had an important, positive impact on my doctoral research and my academic career. After informal meetings with researchers from different institutions, my decision about whether to, and then where to, apply for post-doc positions has been influenced.

I enjoyed this conference and appreciated this opportunity.

### **About the Early Career**

**Researchers Fund:** Financial support is available for Early Career Researchers to attend international meetings and visit international facilities. Bursaries up to the value of £300 are available. Applications are considered on a quarterly basis. For information on eligibility and to apply, see:

[http://www.iop.org/about/grants/travel-bursaries/early-career/page\\_67022.html](http://www.iop.org/about/grants/travel-bursaries/early-career/page_67022.html).

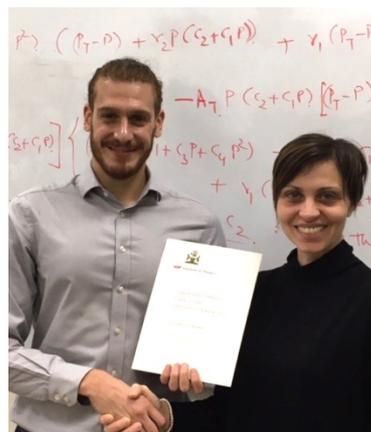
### **Group prize**

#### **LCFG Early Career Award 2017**

The group awards a biennial prize to an exceptional scientist in the early stage of their career, working in the broadly defined area of Liquids and Complex Fluids.

The recipient of the LCFG Early Career Award for 2017 was Dr Lorenzo Di Michele, of the University of Cambridge, for his studies of the structure and

response of soft matter with DNA-mediated interactions.



*The prize was presented to Dr Di Michele by the current LCFG Secretary, Dr Valeria Garbin, in January 2018 with the congratulations of the LCFG Committee.*

Dr Di Michele is currently a Royal Society University Research Fellow (2017) at the Cavendish Laboratory. He joined the Biological and Soft Systems Sector of the Cavendish Laboratory in 2010 to study towards a PhD in soft matter, after receiving bachelor and master degrees in Physics from the University of L'Aquila (Italy). He has held a Leverhulme Early Career Research Fellowship (2015), an Oppenheimer Early Career Research Fellowship from the School of Physical Sciences of the University of Cambridge (2013), and a John Henry Coates Research Fellowship from Emmanuel College.

Dr Di Michele's research group focuses on the use of biomimetic DNA nanostructures for investigating fundamental biophysical and soft matter problems, for the creation of self-

assembled functional materials, and for the development of synthetic biology tools. His previous contributions have included the study of gelation in multicomponent colloidal systems with programmable DNA-mediated interactions, fundamental aspects of DNA hybridisation thermodynamics, and polymer-mediated colloidal interactions.

A one-day meeting on “DNA Nanostructures at Interfaces” will be held in late 2018, focusing on some of the areas in which Dr Di Michele works.

## Forthcoming Events

### **2018 Advanced School in Soft Condensed Matter: “Solutions in the Spring” (6-9 June, University of Bristol)**

*Organised by the IOP Liquids and Complex Fluids Group with support from STFC, SoftComp, and the IOP Polymer Physics Group.*

The 2018 annual advanced school on soft matter will take place at the University of Bristol. Confirmed lecturers: Olivier Dauchot (ESPCI, Paris), Karen Edler (Bath), Rob Jack (Cambridge), Laurence Wilson (York). Formal announcement and deadlines to follow soon.

### **“Unifying Concepts in Glass Physics VII” (11-15 June 2018, University of Bristol)**

*Supported by the IOP Liquids and Complex Fluids Group.*

“Unifying Concepts in Glass Physics” focuses on the glass transition, jamming and related slow and complex relaxation in classical and quantum systems, looking for connections between manifestations of glassy phenomena, contrasting statistical mechanics perspectives on these problems, and exploring applications in other areas of soft and active matter, optimisation, information science, quantum non-ergodicity and beyond. Information at <https://ucgp7.wordpress.com/>.

### **“Formulations and the Processing of Complex Liquids” (13 July, Sheffield)**

*Supported by the IOP Liquids and Complex Fluids Group.*

The main aim of the workshop will be to promote interactions and sharing of ideas among physicists, chemists, engineers and industrial scientists working on formulations. The day will feature 4 talks by industrial scientists outlining the main challenges in their field. This will be followed by a break out session, where people will be working in groups along with industrial speakers on their problems. Details to follow soon.

### **“DNA Nanostructures at interfaces”**

*Supported by the IOP Liquids and Complex Fluids Group.*

A one-day workshop organised by the recipient of the 2017 LGFG

Early Career Award, Dr Lorenzo Di Michele. Formal announcement and details to follow soon.

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Members of the committee welcome your suggestions and comments to help facilitate the running and development of the group at any time.

This newsletter is also available on the web and in larger print sizes

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

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