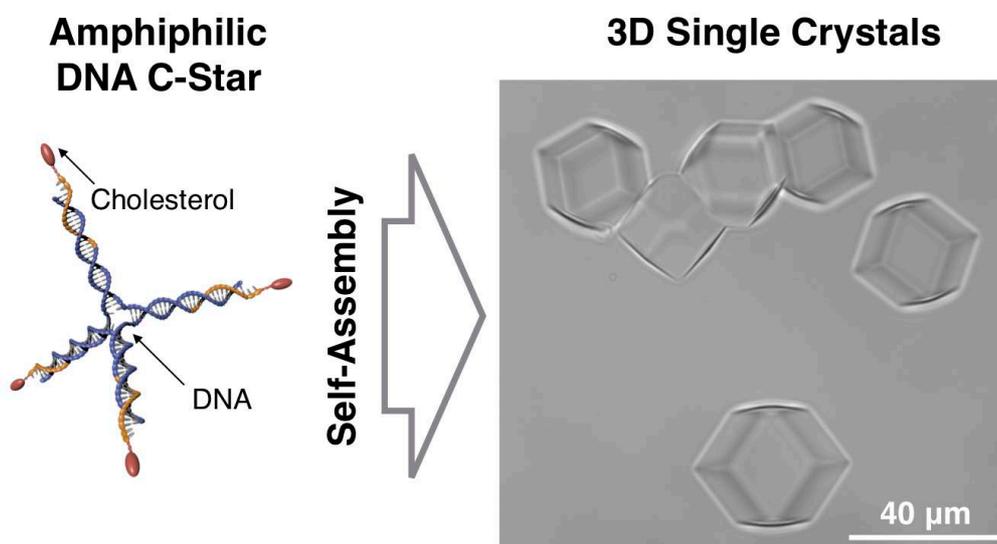


Issue no. 11



Crystallisation of multi-functional amphiphilic DNA nanostructures. Cholesterol-modified DNA nanostars, or C-Stars (left) self-assemble through a combination of Watson-Crick base pairing and hydrophobic interactions leading to the formation of macroscopic single crystals (right) with tuneable lattice parameter and embedded functionalities. From: Nano Lett. 17, 3276–3281, (2017) and J. Am. Chem. Soc. 140, 45, 15384–15392 (2018)

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

We start the New Year with the good news of five new members joining the Liquids and Complex Fluids Group Committee. Welcome! The new committee members are:

Dr Martin Buzza (School of Mathematics and Physical Sciences, University of Hull)

Dr Lorenzo Di Michele (Cavendish Laboratory, University of Cambridge)

Dr Rammile Ettelaie (School of Food Science and Nutrition, University of Leeds)

Dr Timm Krueger (School of Engineering, University of Edinburgh)

Dr Sergey Lishchuk (Materials and Engineering Research Institute, Sheffield Hallam University)

Dr Lorna Dougan has completed her second term and her appointment has now come to an end. We thank her for her sterling service on the Committee.

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 of potential interest to our community.

Reports from previous events

Advanced School in Soft Condensed Matter 2018: “Solutions in the Spring”

Report by Anita Zeidler and Tannie Liverpool (Organisers)

The Advanced School in Soft Condensed Matter ‘Solutions in the Spring’ is an annual event bringing together PhD students from areas covering all aspects of simple to complex liquids and glasses as well as soft matter including colloids, etc.

The school started in 2007, so it is now over a decade old. Originally, the intention was (and still is) to provide students a good grounding in all aspects of liquids and complex fluids by rotating lectures over a 3-year period. In addition, there are workshops and networking sessions.

This year the school took place in Bristol from 6th June until 9th June 2018. We had 36 registered participants and a diverse set of lecturers. Wuge Briscoe (University of Bristol) talked about intermolecular and surface forces in soft matter, Karen Edler (University of Bath) talked about the use of scattering methods for complex fluids, Rob Jack (University of Cambridge) talked about non-equilibrium dynamics in complex fluids, Thomas Speck talked about dynamical arrest and Laurence Wilson talked about experimental studies at low Reynolds number.



Students of the 2018 Advanced School "Solutions in the Spring" wearing 3D glasses during a lecture.

The participants learned that bacteria have noses, that baby oil is a magic fluid that makes things disappear and that the reason for early settlements in river deltas is the Debye length.

On the first day, after the poster session, Bob Evans gave an entertaining lecture on "Heroes/villains in liquid state physics". Participants were asked to guess who these heroes/villains were from their pictures and descriptions. The participants

guessed 15 out of 31 correctly. Luckily no grades were awarded.

The excursion took us to the SS Great Britain and from there we went to the Bristol Harbour Hotel for the conference dinner. After this, Jorge Kurchan told us that 'Physics teaches us that more complex than complex is sometimes simple again, but different'. Here the participants learned that eggs are 99.99 % white in 20D and that granular matter theories are either beautiful or they are right.

Some comments from students were: "Fantastic learning and networking opportunity" and "It's a chance to learn about fundamental science and also to look at current research. Very useful early in your PhD".

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

Unifying Concepts in Glass Physics VII. **Event supported by LCFG**

Report by Paddy Royall (Organiser)

The Unifying Concepts in Glass Physics VII meeting was held in Bristol from 11th-15th June. The event was supported by the LCFG.

The meeting drew over 120 participants from all corners of the globe. Peter Harrowell (Sydney) gave a well-attended public lecture,

putting the field in context for a wider audience.



The participants of the Unifying Concepts in Glass Physics VII meeting

Particular topics discussed at the meeting included the Swap Monte Carlo algorithm of Ludovic Berthier (Montpellier) and coworkers which has gone some considerable way to addressing the limits of computer simulation in addressing the glass transition challenge (typical simulations are around 10 decades shorter in time than dynamics at the operational glass transition, and this has hampered progress in resolving the underlying physics of viscous liquids). The Swap algorithm was used by Mike Cates (Cambridge) and Matthieu Wyart (Lausanne) to challenge certain thermodynamic theories of the glass transition: given the concentration of experts at the conference, it was possible to make progress by sometimes lively discussion. The Gardner Transition and its recent discovery in spin glasses was also discussed by Camille Scalliet.

The conference was unusually popular among its delegates, as

was notable by the intensity of the poster sessions.

The event was supported by the LCFG.

Workshop on Nanostructures at Soft Interfaces: Technology and Biophysics

Report by Lorenzo Di Michele (Organiser)

The workshop was organized by Lorenzo Di Michele (Cavendish Laboratory, University of Cambridge) as part of his 2017 IoP-LCFG Early Career Award.

The one-day event took place on 7th December 2018 at the Maxwell Centre, Cavendish Laboratory, and featured invited speakers Dr Valeria Garbin (Chemical Engineering, Imperial College London), Prof. Oscar Ces (Chemistry, Imperial College London) and Prof. Ulrich Keyser (Cavendish Laboratory, University of Cambridge). Additionally, the programme included contributed talks from senior scientists including Prof. Matthew Turner (Physics, Warwick), Dr Martin Buzza (Physics, Hull), Dr Ralf Richter (Leeds), Dr Guido Bolognesi (Loughborough), and 8 short presentations from junior researchers and students. Lorenzo Di Michele also delivered a seminar. The workshop was followed by a Christmas-style dinner at Trinity Hall College.

The aim of the workshop was to tap into the current activities of the expanding community interested in interfacial nanoscience and nanotechnology, including fundamental soft-matter aspects and its applications to the physics of living systems and bottom-up synthetic biology.

The event began with a bottom-up SynBio session opened by Prof. Ces's seminar on membrane-based artificial cellular systems. The session focusing on interfacial soft matter took place in the late morning and early afternoon, featuring Dr Garbin's lecture on colloidal self-assembly at mechanically perturbed interfaces. The last session was dedicated to biological systems and technological applications, closed by Prof. Keyser with his seminar on DNA-based membrane nanopores. Each oral contribution was followed by a short Q&A session. The audience participated consistently in the discussion, that continued throughout the poster sessions held over lunch and coffee breaks.

Themes including non-equilibrium interfacial dynamics, nanoscale transport phenomena and collective interactions recurred regularly, in the context of e.g. lipid membranes and their protein inclusions, air-fluid interfaces, and multivalent ligand-receptor systems.

The workshop ultimately highlighted the substantial synergies and overlap between apparently distinct areas of interfacial soft matter and biophysics and soft

nanotechnology, demonstrating the scope for larger-scale interdisciplinary initiatives aimed at bringing together this heterogeneous community.

The event was organised by the LCFG with support from the Physics of Life Network.

Reports from Early Career Researchers

In 2018 our Group supported two Early Career Researchers with bursaries to attend international meetings. We are pleased to include reports from these conferences, prepared by the Early Career Researchers in attendance.

2018 APS March Meeting

*Report by Matthew Reynolds,
University of Leeds (PhD student)*

I attended the APS march meeting in Los Angeles, CA, USA between 5-9 March 2018, and presented my work in session A53: Rheology and Flow of Soft Materials. I presented my work focused on the rheology and relaxation dynamics of a polymethyl methacrylate chain length series, including when and how to appropriately apply time-temperature superposition to analyse the behaviour both within the glass and melt. This talk sparked interest from audience members, in particular Prof. Ronald Larson (University of Michigan, USA) who is well known in the field of polymer rheology. He provided some very helpful and constructive

feedback on my results, which was beneficial particularly for putting my work into the context of other work in the literature.

Throughout the conference, I attended talks presented by experts in the field of polymer glasses, such as Prof. Jane Lipson, and Dr. Ronald White (Dartmouth College, USA), who described the use of 'free volume' in describing the temperature and pressure dependence of relaxation time-scales in glass-forming materials. This was of particular importance to my work, as they describe a possible link between free volume and the number of cooperative 'particles' involved in the glass-transition. In my work, I am investigating different approaches of determining the degree of molecular cooperativity in oligomeric and polymeric glass-forming systems, where chain-connectivity is important.

As well as established experts in the field, there were interesting talks by students and postdocs conducting research relevant to my own. An example of this was two talks given by Dr. Adam Raegen, and Junjie Yin who work under Prof. James Forrest (University of Waterloo, Canada) on the distillation of ultra-monodisperse polymers, and measurements of glassy and crystalline properties of these compared to more polydisperse samples. I have already conducted some collaborative work with this group, and being able to discuss this work in person has opened for further

cooperation and collaboration in the future.

Attending this conference has been extremely important to my work as a final year PhD student. The information, feedback and discussion at the conference has strengthened my work, presently in preparation for publication. Moreover, the opportunity to present my work at this prestigious conference gave me experience both in presenting to world-leading experts in the field and to discuss my work with leading academics. The attendance at this conference has thus strengthened my interest and opportunities to pursuing an academic career in physics.

2018 Glass & Optical Materials Division Annual Meeting

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

I attended the 2018 Glass & Optical Materials Division Annual Meeting (2018GOMD) in San Antonio, USA between the 20th and 24th May 2018. It was a very successful and well organised conference.

Many world leading experts in glass field attended and talked at this conference, including Prof Jinchun Du, Prof John McCloy, Prof Alastair Cormack and so on. Particular highlights that interested me included two sessions, one on computer simulation and predictive modelling of glass, the other on glass formation and structural relaxation. Both sessions had excellent speakers and very

interesting topics. Furthermore, the poster sessions were very valuable to discuss research in detail with the attendees. I also 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.

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. As a final year PhD student, this is a great chance to meet people and get a clear idea of the next steps in my academic career. 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.

Forthcoming Events

Group Prize: 2019 Liquids and Complex Fluids Early Career Award

The call for nominations for the 2019 Liquids and Complex Fluids Early Career Award will open soon, with deadline on 31st May 2019 (subject to confirmation). For the latest updates, and to download the nomination form, please see the group website at:

http://www.iop.org/activity/groups/subject/lcf/prize/page_40696.html

The prize is awarded biennially to an exceptional scientist in the early stages of their career working in the broadly defined area of Liquids and Complex Fluids. Previous winners were James Adams (University of Surrey), Dirk Aarts (University of Oxford), Kislun Voitchovsky, (University of Durham) and Lorenzo Di Michele (University of Cambridge).

2019 Advanced School in Soft Condensed Matter: “Solutions in the Summer” (2-5 July 2019)

Organised by the IOP Liquids and Complex Fluids Group with support from the STFC.

The 2019 annual Advanced School on Soft Condensed Matter will take place at Corpus Christi College at the University of Cambridge. Confirmed speakers: João Cabral (Neutron scattering in polymers and microfluidics), Silke Henkes (Active

and passive granular materials), Eric Lauga (Swimmers at low Reynolds numbers), Tim Liedl (DNA nanotechnology). Formal announcement and deadlines to follow soon.

Physics Education for the 21st Century (8-9 March 2019).

Organised by the Higher Education Group with support from the LCFG.

The meeting is organised by Andrea Jimenez-Dalmaroni (Cardiff) and Caroline Clewley (Imperial College). The theme is “Making the invisible visible. Enhancing learning through visualisation”.

Water UK (11-12 April 2019) meeting

Organised by the Royal Society of Chemistry with support from the LCFG.

The Water UK meeting will take place in Bristol and is organised by John Russo (Bristol).

Inkjet printing meeting (May 2019)

Organised by the Printing and Graphics Science Group with support from the LCFG.

The meeting is organised by Gary Wells (Northumbria) and will take place in Edinburgh. Dates to be confirmed.

Dense Active Matter (October 2019)

Organised by the Biological Physics Group and LCFG.

The meeting on Dense Active Matter is co-organised by Tannie Liverpool (Bristol), Silke Henkes (Bristol) and Chiu-Fan Lee (Imperial College). Date to be confirmed.

Also of interest to the LCFG:

Graham award symposium (9 July 2019)

Organised by the joint Colloids Group of the Royal Society of Chemistry and Society of Chemical Industry.

A one-day symposium honouring the contributions of Wilson Poon, the 2019 winner of the Thomas Graham award. The meeting will take place at the SCI in London on the topic of “Industrial and Interdisciplinary Applications of Particulate Suspensions”.

Confirmed speakers: Emanuela del Gado (Georgetown University, USA); John Wight (Corning Inc., Corning, USA); Guillaume Ovarlez (Solvay-CNRS Laboratoire du Futur, Pessac, France); Bill Frith (Colworth Laboratory, UK); and Alison Rust (University of Bristol, UK). The lecture programme will conclude with the Graham Lecture, to be presented by Wilson Poon (University of Edinburgh).

Group committee

Chair:

Prof Tanniemola Liverpool
School of Mathematics
University of Bristol

Dr Sara Fortuna

Department of Medical and
Biological Sciences
University of Udine

Treasurer:

Dr Paul Clegg
School of Physics and Astronomy
University of Edinburgh

Dr Timm Krueger

School of Engineering
University of Edinburgh

Secretary:

Dr Valeria Garbin
Department of Chemical
Engineering
Imperial College London

Dr Sergey Lishchuk

Materials and Engineering
Research Institute
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Committee:**Dr Cesar Mendoza**

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University of Durham

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Physical Sciences
University of Hull

Dr Anita Zeidler

Department of Physics
University of Bath

Dr Lorenzo Di Michele

Cavendish Laboratory
University of Cambridge

Co-opted**Dr Karl Travis**

Department of Materials Science
and Engineering
University of Sheffield

Dr Rammile Ettelaie

School of Food Science and
Nutrition
University of Leeds

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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