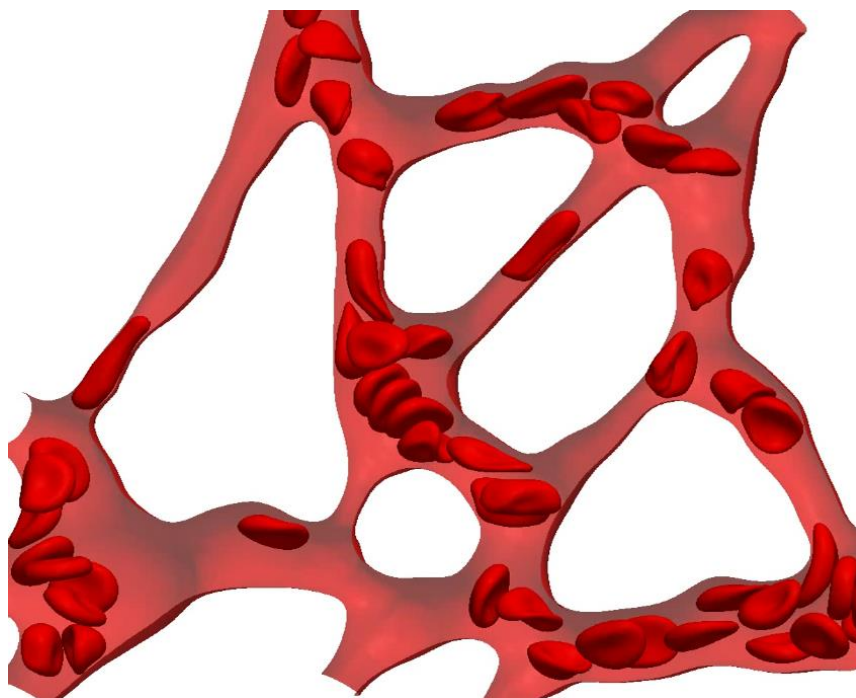


**Issue no. 12**



*Simulation of red blood cells in mouse retinal network. Qi Zhou, Timm Krüger, Miguel Bernabeu. University of Edinburgh*

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

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## Group News

*Lorenzo Di Michele, Secretary,  
Liquids and Complex Fluids Group*

Dr Valeria Garbin stepped down as the Group Secretary, and was replaced by Dr Lorenzo Di Michele. Valeria will however remain in 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 2019: “Solutions in the Summer”**

*Report by Lorenzo Di Michele  
(Organiser)*

The Advanced School of Soft Condensed Matter is organised annually by the LCFG to get

students and early career researchers engaged with the latest developments in the field and help them build a comprehensive background knowledge.

In 2019 the event was held in Cambridge between the 2<sup>nd</sup> and the 5<sup>th</sup> July and hosted in the recently built Maxwell Centre of The Cavendish Laboratory.

The school featured five mini courses, each consisting of two lectures and a practical workshop. The students learned about out-of-equilibrium and active systems thanks to the contributions of Eric Lauga (Cambridge) on the physics of biological micro-swimmers and that of Silke Henkes (Bristol) on active granular and colloidal systems. Joao Cabral (Imperial College) offered a comprehensive overview of neutron scattering, from basic principles to the use of specialised analysis software, while Roel Dullens (Oxford) discussed fundamental aspects of colloidal systems and their optical manipulation. Tim Liedl (TU Munich) demonstrated the use of synthetic DNA molecules as the building block for complex nanostructures and soft materials, and also introduced the students to

the computational tools needed for the designing DNA nanostructures.



*Photo from conference dinner*

The mini courses were complemented by three guest lectures from senior Cambridge academics. In his opening talk, Mike Cates explored the intriguing phenomenology of shear thickening in dense suspensions. Mark Warner's lecture exemplified the effects of curved metrics on the mechanical properties of materials, with the help of jumping metal disks and gigantic rubber bands. Finally, the closing lecture by Daan Frenkel demonstrated the use of clever sampling techniques to "count" uncountably large numbers of microstates in computer simulations.

Poster sessions were held in the atrium of the Maxwell centre and the two poster prizes were awarded to Carla Fernández-Rico (Oxford) and Chiao-Peng Hsu (ETH Zurich).

Luckily for the attendees (and organisers) the school coincided with a somewhat rare spell of "proper" summer, which made the unmissable punting excursion on

the river Cam particularly enjoyable. Shortly after disembarking from the traditional river boats, the participants reconvened at Churchill College for a classy school dinner (see photo).

The event was well attended, with over 40 registered participants.

The organisers would like to thank IoP and the Science and Technology Facilities Council for making the school possible through generous financial support.

### **Water UK. Event supported by LCFG**

*Report by John Russo (Organiser)*

Water UK was held at the University of Bristol on the 11th and 12th of April 2019, and its goal was to bring together the UK community working on water, with particular emphasis on its physical properties.

The workshop featured talks covering state-of-the-art research in fields such as water crystallisation, hydration of bio-molecules, water under extreme conditions (supercooled and/or high pressure), and amorphous water. It featured both experimental and theoretical contributions, with sessions organized around common themes to favour the exchange of ideas.

More than 50 people attended the meeting, with prominent water scientists coming not only from

across the UK, but also Japan, Netherlands, Spain, and Italy.



*Water UK meeting in action!*

The workshop featured three special events. A talk from Prof. Bob Evans (School of Physics, Bristol) who gave an evocative historical account of the 37th Symposium of the Colston Research Society that was held in Bristol in 1985, where several milestone results on the interatomic structure of water were first presented. The second special contribution was from Prof. Mike Allen (School of Physics, Bristol) who gave a delightful talk on the past 50 years of water simulations. The last event was a public talk given by Dr. Fausto Martelli from IBM research on “The mysteries of water: a journey of (almost) 100 years”, and which was well attended by members of the academic community and from the general public.

### **Physics in Food Manufacturing Conference 2020**

*Report by Rammile Ettelaie  
(Organiser)*

Some of the most widely encountered examples of soft matter and complex fluids occur in food systems. Therefore, it was inevitable that sooner or later the Liquids and Complex Fluids group (LCFG) and Physics in Food Manufacturing group (PiFM), both of IOP, would get together to organise a joint conference.

Such a meeting took place this year on 15-17<sup>th</sup> January in Weetwood Hall conference centre in Leeds, taking advantage of the fact that the local organising committee, chaired by Prof. Megan Povey, was part of the School of Food science and Nutrition which has serving members in both of the two IOP committee groups. The conference was attended by around 60 delegates, with a good mix from both academia and industry. As well as the two IOP groups, the conference was also sponsored by “Malvern Panalytical” and “ProUmid”.

The broad and diverse range of the application of ideas from soft matter physics and complex fluids to food industry, and the recent progress that this has brought, was truly astonishing. It seemed not only that our discipline has a significant role to play in food manufacturing, but that also foods often provide intriguing model systems for researchers engaged in understanding fundamental physical behaviour of complex fluids and soft materials. Altogether around 35 talks were presented in

the 2.5 days at the conference. It was quite refreshing to see a good proportion of industrial and academic related research as well as a significant representation of talks by postdoctoral and PhD student attendees.



*Rammile Ettelaie, representing LCFG, together with some of the current IOP committee members of PiFM*

It is not possible to touch upon every talk in a short overview here. However, to provide a flavour, some notable examples were the talk by Matt Sinott on the use of discrete particle models to perform ultrarealistic simulations of complex fluid flow in real food process operations. The talk by Wilson Poon was a particular example of how fundamental work on concentrated particulate dispersions is helping to shed light on the true purpose and functionality of long established, but often very poorly understood, practices in food manufacturing, such as the conching process in confectionary industry. Brent Murray presented a talk in which food systems were used as model systems to study behaviour of Bijels, water in water emulsions, as well as more generally the behaviour of nanoparticle in phase separated polymer solutions. John

Melrose discussed some of his historical simulation results on rheological properties of hard sphere particulate dispersions, but with interesting new interpretation and conclusions that explained shear thickening and thickening transitions. Yue Ding presented an interesting talk on the use of Self-Consistent-Field theoretical calculations, as applied to polymers at interfaces, to aid the design of novel food grade edible emulsions. Practical progress that such an approach had yielded so far was also discussed. Sergey Lishchuk's talk addressed the extension of Einstein's equation, for bulk viscosity of colloidal dispersions, to the surface viscosity of particle laden interfaces, while that of Valerie Penfield reviewed the recent developments in the theory and experimental aspect of acoustic scattering as applied to characterisation of emulsions in food systems. Last but not least, Sergey Lishchuk also took the opportunity to publicise our group, highlighting the history and achievements of LCFG, its awards and the trust of its interests.

The above are but a snap shot of some the talks at the conference, but the take home message from this conference was that the union of physics of soft materials / complex fluids and food science and processing is a rich and exciting emerging area of research for physicists, physical chemist and food scientists, alike.

## Reports from Early Career Researchers

In 2019 our Group supported one Early Career Researcher with a bursary to attend an international meeting. We are pleased to include the report from the conference, prepared by the Early Career Researcher in attendance.

### 72<sup>nd</sup> APS Division of Fluid Dynamics Meeting

*Report by Naval Singh,  
Loughborough University (PhD student)*

I would like to thank the IOP Liquids and Complex Fluids Group for granting me the prestigious Research Student Conference Fund which enabled me to attend the above meeting in Seattle, Washington, USA on November 23-26, 2019. Attending this meeting was a great opportunity for me to present my research work on colloidal particle manipulation by diffusiophoresis in microfluidic devices (session H36: Microscale Flows: Particles) and provided me a great stage to showcase my oral presentation skills. I feel immensely privileged and honoured for the recognition I have received and wish to express my sincere gratitude to my supervisors for their support.

The APS-DFD annual meeting is one of the major events in the field of fluid dynamics and was attended by eminent scientists from all over

the world. My research was much aligned with a number of conference topics and enormously helped me to network with the community worldwide. As this conference aims at a specialist audience, I was able to get feedback for my research work and many faculty members seemed interested and advised me on exploiting several great potentials for application. The state-of-the-art research talks were delivered by participants from academia as well as the industry which gave me an opportunity to extend my knowledge in various other fields of fluid dynamics.

Other than talks, social events were very well organised. The events such as advice on applying to faculty and postdoctoral positions and a tutorial for authors and referees were really helpful for networking with young researchers and delivered important information.

In a nutshell, attending the APS-DFD meeting was a remarkable experience and will contribute significantly to my professional development.

### ***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:

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

## Group prize

### LCFG Early Career Award 2019

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 2019 was Dr Rachel Bennett, of the University of Bristol, for her work on theoretical modelling of the mechanics of cells and swimming microorganisms.

Rachel joined the School of Mathematics in Bristol at the end of 2018 as a Vice-Chancellor's Fellow. Previously, she did a postdoc in the soft matter theory group in physics at the University of Pennsylvania, following a DPhil at the University of Oxford, developing hydrodynamic models of microorganism behaviour. Her research involves developing models of single cells to study the role of hydrodynamic and mechanical forces in various biologically motivated problems including bacteria-surface interactions and DNA damage in migrating cancer cells. In addition, her group has recently begun considering several aspects of intracellular phase separation.



The prize was presented to Dr Rachel Bennett by the current LCFG Chair, Prof Tannie Liverpool, in January 2019 with the congratulations of the LCFG Committee.

A one-day meeting in honour of Rachel's award will be held in 2020, focusing on some of the areas in which she works.

## Forthcoming Events

### 2020 Advanced School in Soft Condensed Matter: "Solutions in the Spring" (6 – 9 April 2020, Sheffield)

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

The aim of this School is to provide a comprehensive foundation for researchers in the field of soft matter, liquids and complex fluids. The lectures will introduce key topics of current interest together with the theoretical, experimental and computer simulation approaches used to address them. The School is directed towards

postgraduate students from a wide range of backgrounds including physics, chemistry, chemical engineering and biophysics.

Currently confirmed speakers include Robert Evans (University of Bristol), Rhoda Hawkins (University of Sheffield), Tom McLeish (University of York), Wilson Poon (University of Edinburgh), David Zwicker (MPI for Dynamics and Self-Organization, Göttingen).

School web page:

<http://asm2020.iopconfs.org/home>

*Key dates:*

Poster abstract submission  
deadline: 02 March 2020

Registration deadline: 29 March  
2020

**UK Colloids 2020  
International Colloid and Surface  
Science Symposium (20 – 22  
July 2020, Liverpool)**

**Abstract submission now open**

This is the fourth colloid science conference in this series and will be held on the riverfront with numerous hotels, the Albert Dock restaurants and the Beatles museum all within walking

distance! The meeting will provide a perfect opportunity for UK and international colloid and interface researchers to network and present/discuss issues related to current developments in our field. The keynote speakers have all been confirmed for the 13 themed sessions along with three plenary speakers. The meeting will also include a presentation by the Rideal lecture winner Prof Colin Bain of Durham University. There will be a pre-registration event in the Beatles Museum on the Sunday evening and the conference dinner will take place in the crypt of the Metropolitan Cathedral. The abstract submission process for oral presentations and posters is now open

Finally a big thank you to generous sponsorship by Unilever, Synthomer, Infineum and Salt Healthcare

**Polymer Physics Conference in  
honour of Prof Athene Donald  
(21 – 22 Sep 2020)**

**Save the date!** Please contact the event organiser Prof João Cabral for more details:  
([j.cabral@imperial.ac.uk](mailto:j.cabral@imperial.ac.uk))



## Group committee

**Chair:****Prof Tanniemola Liverpool**

School of Mathematics

University of Bristol

**Treasurer:****Dr Paul Clegg**

School of Physics and Astronomy

University of Edinburgh

**Secretary:****Dr Lorenzo Di Michele**

Cavendish Laboratory

University of Cambridge

**Committee:****Ms Tunrayo Adeleke-Larodo**

Department of Physics

University of Oxford

**Dr Martin Buzza**

Department of Physics and

Mathematics

University of Hull

**Dr Rammile Ettelaie**

School of Food Science and

Nutrition

University of Leeds

**Dr Sara Fortuna**

Department of Medical and

Biological Sciences

University of Udine

**Dr Timm Krueger**

School of Engineering

University of Edinburgh

**Dr Sergey Lishchuk**

Materials and Engineering

Research Institute

Sheffield Hallam University

**Dr Cesar Mendoza**

Unilever

**Dr Margarita Staykova**

Department of Physics

University of Durham

**Dr Anita Zeidler**

Department of Physics

University of Bath

**Co-opted****Dr Karl Travis**

Department of Materials Science

and Engineering

University of Sheffield

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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