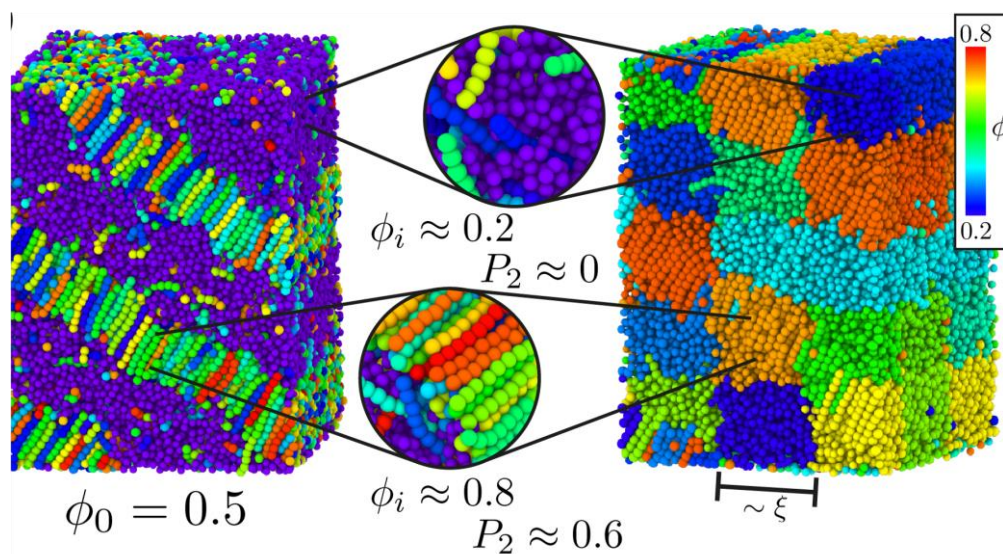


**Issue no. 14**



Snapshots from coarse-grained molecular dynamics simulations of long, rigid mesogens in a "bad solvent" of shorter oligomers. As a result the mixture spontaneously phase separates into mesogen rich and solvent rich regions. Panel (a) shows a simulation snapshot of the whole simulation box, which when zoomed into reveals the coexistence of multiple phases. The order parameter,  $\phi$ , describing this phase separation is equal to the local, excess mesogen concentration. Due to spontaneous phase separation, the distribution of order parameter (shown in panel (b)) is three-peaked. The peak at  $\phi \sim 0.3$  denotes an oligomer-rich isotropic liquid, while the peak at  $\phi \sim 0.8$  denotes a mesogen rich nematic phase. We also observe a micro phase-separated smectic phase at the largest mesogen densities when  $\phi \sim 0.9$ . The colour scheme for the symbols in panel (b) is the local nematic order for the corresponding window of  $\phi$  value. (Image from: W. S. Fall, H. B. Kolli, B. Mukherjee, B. Chakrabarti, arXiv:2112.02296 [cond-mat.soft])

For further details of the Liquids and Complex Fluids Group, see:  
<https://www.iop.org/physics-community/special-interest-groups/liquids-complex-fluids-group#gref>

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## Group News

*Lorenzo di Michele (Secretary) and Martin Buzza (Newsletter), Liquids and Complex Fluids Group*

2021 has seen the group's activities adapted to the constraints of the ongoing pandemic, with all sponsored and organised events having taken place in remote format. Still, the pandemic continues to have a tangible effect on research. In this issue, in addition to our usual reports from previous events, we have invited two PhD students, one a theorist, the other an experimentalist, to share their experiences of what it has been like to do a PhD in the pandemic as its bite begins to ease. Many thanks to Layla and Shuvo for sharing their stories!

In other group news, Dr Guido Bolognesi and Prof. Kostya Trachenko joined the committee as ordinary members, while our former Chair Prof. Tanniemola Liverpool completed his tenure as a co-opted member and left the committee. Similarly, Prof. Paul Clegg, former treasurer, stepped down as committee member. We would like to thank Tannie and Paul for the

sterling work they have done for the group.

We would also like to highlight to all members of the group 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 that is likely to be of interest to the community. Contact details of committee members can be found at the end of this Newsletter.

## Chair's Address



*Serafim Kalliadasis, Chair, Liquids and Complex Fluids Group*

Happy New Year to each and every one of you, hopefully you were able

to have some good quality downtime over the holidays.

It has been another difficult year for all of us and the IoP Liquids and Complex Fluids Group (LCFG) is not an exception. Nevertheless, LCFG has been active across all fronts in its remit, such as conferences and schools, in terms of organization but also sponsorship.

As we emerge in 2022, I'm cautious but also optimistic. Cautious as the pandemic continues to influence our daily lives and work, which inevitably impacts the Group's activities. Optimistic as there seems to be an elevated feeling around the country and beyond for a return to some degree of normality.

Either way, LCFG is well positioned to continue its activities successfully and to move forward. In addition to meetings, awards and training, we also have a number of worthwhile goals: collaboration within LCFG to explore research opportunities and initiatives; connect with other IoP groups, such as Soft Condensed Matter and Non-linear and Complex Physics; and expand public appreciation of LCFG and its many contributions.

As we move forward, we face a time of major change. One of my top priorities over the next few months will be, in consultation with group members, to develop a future-oriented statement of LCFG's mission and try to unify

group activity toward a "planned" future.

I wish you all the very best for the New Year.

## Reports from previous events

**Advanced School in Soft Condensed Matter "Solutions in the Summer"**, 5 - 9 July 2021  
(Online event)

*Report by Sergey Lishchuk and Rammile Ettelaie (Organisers)*

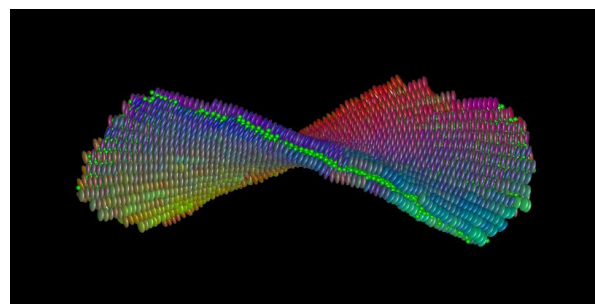


Image from: A. Dastan, E.A. Matsumoto, W.J. Frith and D.J. Cleaver, *Mol. Phys.* **116**, 2823 (2018)

The Advanced School of Soft Condensed Matter is organised annually by the LCFG to get students and early career researchers to engage with the latest developments in the field and help them build a comprehensive and broader background knowledge of the current research in the area. Due to the Covid situation, the 14th edition of the School planned for 2020 was postponed and held online between the 5th and the 9th July 2021.

The first day of the School featured the overviews of soft matter by Roberto Piazza (University of Milan) and fluid phase behaviour by Robert Evans (University of Bristol). In the next days these overviews were followed by a number of mini courses, each consisting of one or two lectures on more specific topics. The students learned about colloidal systems (Nigel Wilding, University of Bristol), active matter (Julia Yeomans, University of Oxford), non-Brownian suspensions (Wilson Poon, University of Edinburgh), electrolytes (Susan Perkin, University of Oxford), self-assembly (John Russo, Sapienza University of Rome), filamentous colloids (Raffaele Mezzenga, ETH Zürich), ring polymers (Christos Likos, University of Vienna) and liquid crystals (Helen Gleeson, University of Leeds). Following a students' vote, an additional lecture was given by Wilson Poon about soft matter physics of SARS-CoV-2 transmission.

Poster sessions were held virtually. 38 posters were presented. Two poster prizes were awarded to Deniz Mostarac (University of Vienna) for the poster "Directional assembly of DNA nano-chambers into polymer-like structures" and Naval Singh (Loughborough University) for the poster "Reversible Trapping of Colloids in Microgrooved Channels by Diffusiophoresis".

The event was well attended, with 202 registered participants from 32 countries: Australia, Austria, Brazil,

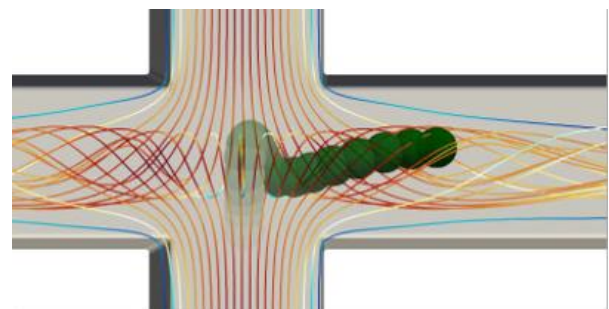
Canada, China, Czech Republic, France, Germany, Iceland, India, Iran, Israel, Italy, Korea, Luxembourg, Mexico, Netherlands, Poland, Qatar, Russia, Saudi Arabia, Slovenia, Spain, Sweden, Switzerland, Turkey, UAE, UK, Ukraine, USA, Venezuela and Vietnam. Between 92 and 142 students were present at each lecture.

The answers to the feedback question: "Did the event meet your expectations?" were 94% "Yes", 2% "No", and 4% "Don't know". The lowest vote was (not surprisingly) for the category "Social/Networking". Despite the success of the school, the aim is to go back to the more customary "in person" format for this year, Covid restrictions permitting.

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

### **Inertial Microfluidics – Challenges and Perspectives, 2-3 September 2021 (online event)**

*Report by Timm Krüger (Organiser)*



Inertial microfluidics is a relatively novel concept that relies on fast flows in microfluidic geometries, leading to finite inertia – the Reynolds number is typically of the order 10–100. Inertial microfluidics is commonly used to manipulate suspended particles or to mix liquids, and it is a key driver of “lab-on-chip” developments. Although there are various international conferences focusing on microfluidics, inertial microfluidics had so far not benefited from a dedicated workshop.

On the afternoons of 2 and 3 September 2021, we ran the first international inertial microfluidics workshop as an IOP online event. The programme comprised of two keynote presentations, five invited presentations, two poster sessions, and two panel discussions. Around 35 participants attended the workshop each day.

In the first keynote presentation, Pier Luca Maffettone and Massimiliano Villone (Naples) presented their modelling work about the migration of rigid and soft particles in inertial microfluidics. On the second day, Ian Papautsky (Chicago) highlighted the complexity of particle dynamics in curved channels and recent experimental progress.

The invited speakers covered a wide range of fundamental research and applications of inertial microfluidics. Masako Sugihara-Seki (Kansai and Osaka) combined experimental and numerical

expertise to explain particle focusing in straight channels. Claire Hur (Johns Hopkins) highlighted the importance of spin-out companies for the translation of inertial microfluidics with applications in the recovery of clean cell populations and genetic engineering. Lionel Guillou (Cytovale) showed the audience how inertial microfluidics is already used for sepsis detection that could save thousands of lives in the future. On the second day, Pascale Magaud (Toulouse) addressed the important problem of particle suspensions and particle interactions in inertial microfluidics. Finally, Holger Stark (Berlin) presented simulation results, covering particle control, particle lift forces, and stability of particle trains in inertial microfluidics.

The ten posters were first presented via pre-recorded flash videos, followed by dedicated discussions in Zoom break-out groups between which attendees could move freely. The presented topics ranged from micro-swimmers in inertial flows, over microfluidics for axial particle spacing, to stretchable microfluidic devices.

The panel discussions aimed at identifying challenges and perspectives for young researchers in inertial microfluidics research. Both panels consisted of experts in inertial microfluidics – Helen Bridle (Heriot Watt), Dino Di Carlo (UCLA), Amy Shen (Okinawa), Majid Warkiani (Sydney) – and the invited speakers of the day. One opportunity that emerged in the

discussions was the potential of simulations to shed light on the underlying mechanisms behind the multitude of effects that have been observed in inertial microfluidic experiments.

We thank the IOP for their fantastic support throughout the workshop planning and delivery phases. We also thank the European Research Council for funding the SIRIUS project (<https://sirius.biofm-research.com/>) that sparked the idea of the workshop.

**Designed Assembly of Colloids at Interfaces: Fundamentals to Applications**, 14 – 16 June 2021 (Online Event)

*Report by Martin Buzza (Organiser)*

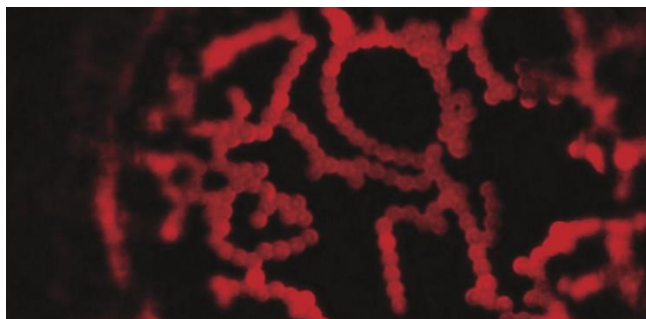


Image from A. Huerre

The aim of the conference was to bring together the diverse research communities interested in colloids at interfaces, from fundamental science to applied research, in order to cross-pollinate ideas and stimulate new research directions in these fascinating systems. The conference was organised by Martin Buzza, Olivier Cayre and Valeria Garbin and sponsored by the IOP Liquids and Complex Fluids Group, RSC and SCI.

We had a very strong line up of invited speakers, including

- **Bernie Binks** (University of Hull, UK), Edible Oil Foams Stabilised by Surfactant or Fat Crystals
- **Nikolai Denkov** (Sofia University, Bulgaria), Shape-shifting droplets as building blocks for micro- and nano-structured dynamic materials
- **Sepideh Razavi** (Oklahoma University, USA), Assembly of Janus particles in soft matter: from interface stabilization to membrane applications
- **Tom Russell** (University of Massachusetts at Amherst, USA), Structuring liquids
- **Rene van Roij** (Utrecht University, Netherlands), Capillary interactions and self-assembly of odd-shaped particles at fluid-fluid interfaces.

The conference attracted over 100 delegates from 17 countries. The quality of abstract submissions for both oral and poster presentations was high and there was a good balance between theory and experiment, as well as between researchers at different stages of their careers (from PhDs to professors). The IOP conference team did an excellent job in facilitating the online format for the talks and poster sessions and we even managed some social meet and greet sessions using break-out rooms!

Despite the online format, there was excellent audience

participation for all the talks, with an attendance of over 50 for all talks and lively Q&A after each talk. The overall feedback for the conference was excellent, and there was a strong feeling among the delegates and the committee that it we should organise another conference on this theme in the future.

## Reports from Early Career Researchers

**Advanced School in Soft Condensed Matter “Solutions in the Summer”**, 5 - 9 July 2021  
(Online event)

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



I am really grateful to the IOP Liquids and Complex Fluids Group for giving me the opportunity to write yet again for this prestigious annual newsletter. First of all, I would like to thank and congratulate the committee for organising such an event in tough pandemic times.

I presented my published research work in [PRL](#) titled “*Reversible Trapping of Colloids in Microgrooved Channels by Diffusiophoresis*” and was winner of the poster prize during the Advanced School in Soft Condensed Matter. This research has also been featured in the famous British magazine, [The Engineer](#). Attending an Advanced School online was a unique and remarkable experience. The insightful invited talks from eminent scientists around the globe on unravelling thought-provoking research from basics to the applications of surface and interfacial science in the real-life problems was the main highlight of the School.

The invitees were experimentalists, theorists and computer simulators working in these fields. It covered topics ranging from simple liquids to complex fluids, fluid phase behaviour and soft materials such as polymers, colloids, liquid crystals, and physics of SARS-COV-2 transmission. Moreover, the informal networking and poster sessions were organised to network with researchers from different universities and industrial delegates. 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. In a nutshell, attending Advanced School has been an exceptional experience and I would encourage early stage researchers

to participate in summer schools for their professional development.

## Perspectives – doing a PhD in a pandemic

### An experimentalists story

*By Layla Malouf, Department of Chemistry, Imperial College*



My studies started in late January 2020, so I had a little over a month of training before our labs shut down.

Three months at home sounds like an ideal opportunity to do some reading and writing, but it is not easy to work in atmosphere of worry, fear, and uncertainty, and I struggled to maintain focus in getting through a stack of papers. A year later I found out I needed reading glasses, so that probably didn't help matters.

However, being the type of person who is more motivated by solving problems, the enforced time out of

labs was an excellent opportunity to develop essential programming skills I'd need for the rest of my PhD. Just as I was starting to tire of analysing the same set of images for what felt like the hundredth time, the labs reopened – initially part-time, and later for full-time work.

Returning to labs was a welcome distraction from the pandemic. I was able to get stuck in with hands-on research, something I'd sorely missed in my time at home (experimenting with bread doesn't quite compare, except perhaps on taste\*). Being in the labs part-time forced efficiency in experimental design, and I found the lowered lab occupancy rather nice – less competition over precious confocal time.

I am grateful to now be back in the office/labs full-time. Having a dedicated workspace helps in separating “work” from “home” life, which I personally find is essential for maintaining sanity. This is especially important when, as is often the case for students, one's desk is in their bedroom. If I wasn't careful, I found I could spend an entire day in one room – cabin fever certainly set in on a regular basis.

It has been a horrendously difficult, bizarre, and frustrating two years, but this has been the case for most people across the world. Despite all my concerns on how the pandemic has affected my PhD progress, I try to take a step back and remind myself that “it could be worse” - I



know that I have been incredibly lucky so far and can only hope that this continues.

*\*note to PI and department safety officers: not established experimentally.*

## A theorists story

*By Subhadip Biswas, Department of Physics and Astronomy, University of Sheffield*



The ongoing Covid pandemic has brutally affected people all over the world. As a theoretical physicist, though it is apparently an easy job looking from the outside as we only need a pen, paper and a computer, it was not easy when the whole world was submerged into a panic situation. At the beginning of the pandemic, it was difficult to concentrate on work or study due to an unprecedented panic situation. Most PhD students were stuck at home, alone and far from family with very little prospect of seeing their family in the foreseeable future, which I suppose was difficult for all, especially international

students. When slowly everything started to become stable, I started working long hours, rather forcefully focused on work as I was in the final year of my PhD. A good internet connection is one of the essential requirements for researchers. Unfortunately, the internet connection at the place where I used to live was extremely slow. As my work involves extensive simulations and data processing, running the program on a laptop was quite challenging. Therefore, I needed to access my office desktop and run programs there remotely. Due to a sluggish internet connection, remotely accessing and doing regular work was exhausting and time-consuming. At times when the remote connection was broken, we had to seek prior permission to enter the department building to reconnect with (or turn on) the desktop machine, a process that could take days.

The undergraduate labs started (abiding by covid restrictions) in the Fall 2020 semester of hybrid teaching. As a GTA, I used to help teach the course. Only that time, I could talk to people face-to-face, which made me feel alive. I like to read printed material rather than digital ones. Therefore, I ended up reading fewer research articles during the pandemic. In terms of productivity at home, it varies from person to person. Some people live in a studio room or shared room with a small number of other students. However, it is difficult for those who live in shared

apartments, and the room is not ideal enough to work normally as in the office for long hours. Furthermore, due to the restrictions in interactions through the national lockdown, I had to limit my interactions with my supervisor over the internet and missed out on my daily interactions with a senior postdoctoral fellow, which would otherwise happen in the lab, as we share office space. I used to benefit from these un-scheduled interactions with my supervisor and a senior postdoctoral fellow and neither of these were readily available during the lockdown as the unnatural situation was demanding for everyone. On a personal note, due to the overstressed situation and long working hours in a non-ideal condition, I suffer from chronic upper back spasms, right-hand pains (proficient in right-hand use). Finally, everyone in academia suffered from different prospects due to the pandemic. PhD students faced most of the difficulties in finishing projects/thesis, finding jobs, mental health, *etc.* I believe that they should be supported by providing sufficient months of funded extension and mental health support.

## **Forthcoming Events**

**2022 Advanced School  
“Solutions in the Summer”  
(4 – 7 June 2022, 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 Andrew Archer (Loughborough University), Rhoda Hawkins (University of Sheffield), Gregory Smith (ISIS Neutron and Muon Source) and Job Thijssen (University of Edinburgh).

More details will be circulated to the group members in due course.

### **Microrheology and Transport in Complex Biological Media (16-18 May 2022) – online**

Within complex biological systems, transport of nutrients, wastes and signalling molecules is influenced by various physical mechanisms, including fluid flow, diffusion and active transport. To understand the general relationships between structure and function in such systems, it is important to characterise the relative importance to transport of the dominant physical processes, as well as the system's geometry. In recent work, experiments and theory have been

used to delineate the effects of geometry, fluid flow, diffusion and active biological processes on transport in various idealised and realistic model systems. This is a rapidly developing field that has many challenging open questions. This international workshop will bring together experimental and theoretical researchers to investigate the relationship between physics and geometry in diverse systems with complex geometries. We will in particular focus on vascular networks and soft biological tissues, in which fluid flow is the primary mechanism for transport. To promote interdisciplinary communication and collaboration, we also expect to invite research leaders in the fields of porous media and geophysics with relevant methodological expertise. The goal will be to discuss the state-of-the-art techniques used to characterise these different systems, including how the associated physical and biological processes interact across different spatial scales, and how to

accurately parametrise multi-scale models. Beside experimental techniques we will discuss the need for advanced simulation methods and their verification and validation. Such techniques are expected to be highly applicable between systems in physics, biology and engineering.

For further details, please contact:

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## 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/research-student-conference-fund#gref>.

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## Group committee

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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.

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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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