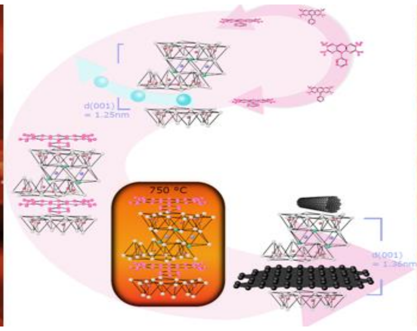


9th Annual International Workshop on

Soft & Complex Matter

Norwegian Academy of Science and Letters

Drammensvegen 78, Oslo, Norway, September 15-16, 2023

Invited speakers:

Andreas Carlson University of Oslo, Norway
Eric Clement, ESPCI-Sorbonne, Paris, France
Paul Dommersnes, NTNU, Trondheim, Norway
Maria Helena Godinho, NOVA University Lisboa, Portugal
Askwar Hilonga, Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha, Tanzania
Min-Hui Li, Institut de Recherche de Chimie Paris, CNRS - Chimie ParisTech, France
Reidar Lund, University of Oslo, Norway
Barbara Pacakova, NTNU. Trondheim, Norway
Adrian Rennie, Uppsala University, Sweden
Patrick Tabeling, ESPCI/IPGG, Paris, France
Jaakko Timonen, Aalto University, Finland

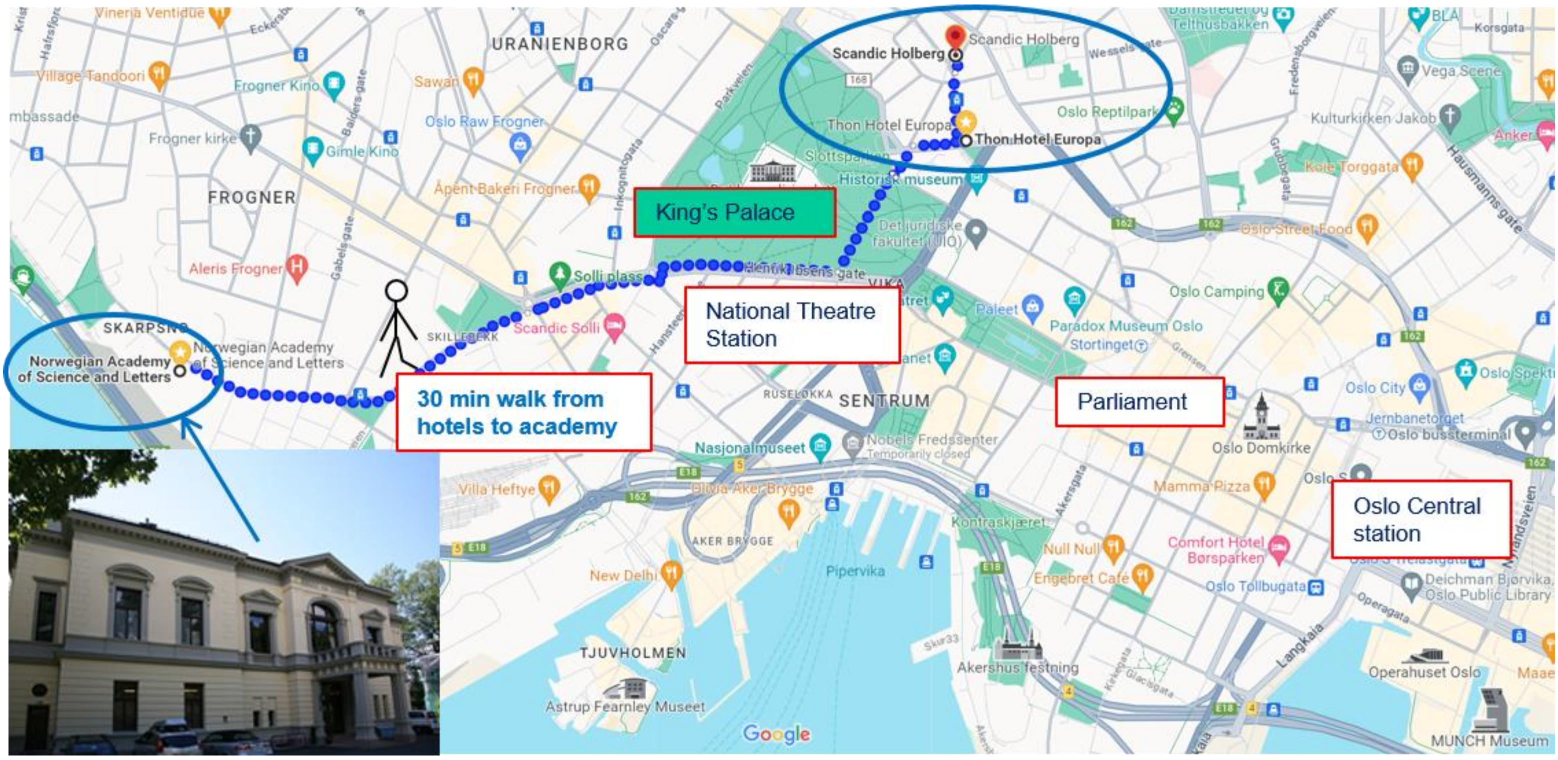
Contributed talks:

NTNU:
Andrew Akanno
Negar Azizi
Namrah Azmi
Yue Yue

University of Oslo:
Sami Al-Izzi
Bharti Bharti
Stéphane Poulain
Boxue Zheng

Organizers and contact:

Jon Otto Fossum (jon.fossum(at)ntnu.no) NTNU, Trondheim, Norway
Leide P. Cavalcanti, ISIS Neutron and Muon Source, UK



Program and Book of Abstracts

9th Annual International Workshop
Soft & Complex Matter

Norwegian Academy of Science and Letters
(DNVA)
Oslo, Norway
September 15-16, 2023

	Friday 15 / September / 2023
13:00	*Registration / Coffee/ Discussions*
13:50	**Jon Otto Fossum:** *Welcome*
14:00	**Andreas Carlson**: *Elastohydrodynamic flows*
14:30	**Reidar Lund**: *Structural Pathways for Lipid Membrane Solubilization*
15:00	**Askwar Hamanjida Hilonga**: *From the laboratory to the market (The Case of a Low-cost Water Purification System, Nanofilter)*
15:45	*Coffeebreak and discussions*
16:15	**Bharti Bharti**: *Plateau-Rayleigh Instability in a Soft Viscoelastic Cylinder with Rigid Inner Core*
16:30	**Sami Al-Izzi**: *A Twist On Active Membranes: Odd Mechanics, Spontaneous Flows and Shape Instabilities*
16:45	**Boxue Zheng**: *Static wetting of a barrel-shaped droplet on a soft-layer-coated fiber*
17:00	**Stéphane Poulain**: *Sliding, vibrating and swinging droplets on an oscillating fibre*
17:15	**Andrew Akanno**: *Bacteria Motility in Laponite Suspensions*
17:30	**Yue Yu**: *Structural coloration in water droplets containing suspended clay mineral nanosheets*
17:45	*Coffeebreak and discussions*
18:15	**Negar Azizi**: *Buckling of Pickering Layers*
18:30	**Namrah Azmi**: *Moringa oleifera proteins as Pickering stabilizers*
18:45	**Adrian Rennie**: *A physicist's look at Moringa seed proteins – understanding applications*
19:15	**Barbara Pacakova**: *2D world in the Soft and Complex Matter Lab– clay, graphene and beyond*
19:45	*Discussions*
20:00	*Dinner*
22:00	*After dinner disuccuins / Coffee etc.*

	Saturday 16 / September / 2023
09:00	*Registration and discussions*
09:30	**Maria Helena Godinho**: *Cellulose self-assembled systems: from molecular to the macro scale*
10:00	**Min-Hui Li**: *Electroactive Bi-functional Liquid Crystal Elastomer Actuators*
10:30	**Eric Clement**: *Active bacteria dispersion*
11:00	*Coffeebreak and discussions*
11:30	**Paul Dommersnes**: *Elastic vortices in active solids*
12:00	**Jaakko Timonen**: *Magnetic Quincke Rollers*
12:30	**Patrick Tabeling**: *Microfluidic stories*
13:00	**Jon Otto Fossum:** *Concluding remarks*
13:10	*Lunch*
14:00	*After lunch discussions / Coffee*
15:00	*Workshop End*  Norwegian Academy of Science and Letters (**DVNA**), Drammensvegen 78 Oslo, Norway.

Friday, 15 / September / 2023

1300-1350 Registration / Coffee / Discussions

1350-1400 Welcome

Jon Otto Fossum

Soft and Complex Matter Lab, Department of Physics, NTNU, Norway

1400-1430 Elastohydrodynamic flows

Andreas Carlson

Mechanics Division, Department of Mathematics, University of Oslo, Norway

I will in this talk present some of our effort to understand the elastohydrodynamics of fluids injected under elastic plates. Through the talk I will illustrate how the dynamics is affected by the liquid rheology (yield stress) as well the coalescence dynamics of two elastic blisters filled with a viscous fluid meets.

1430-1500 Structural Pathways for Lipid Membrane Solubilization

Reidar Lund

Chemistry Department, University of Oslo, Norway

Understanding the pathways of solubilization of lipid membranes is of significant importance for their use in biotechnology and industrial applications. Although lipid vesicle solubilization by classical detergents has been widely investigated, the pathways have not been studied systematically comparing various lipid compositions and “slow” and “fast” solubilizing detergents. In this work, we interrogate the classical three-step for solubilization1 and use (time-resolved) small-angle X-ray scattering, (TR-)SAXS to determine the structural pathways paying attention to potential metastable, intermediate nanostructures. Membranes composed of either of two zwitterionic lipids, DMPC or DPPC, varying in their melting point and their interactions with three different detergents, sodium dodecyl sulfate (SDS), n-dodecyl-beta-maltoside (DDM), and Triton X-100 (TX100), were tested. The results show that there are important differences, whereas SDS adhere quite close to classical model eventually leading to mixed micelles, the non-ionic detergents quite differently.2 DDM is able to cause a transition from uni-lamellar (ULV) to multi-lamellar vesicles (MLV) while TX-100 can cause the formation of novel “rippled” nanodiscs that resembles collapsed single vesicles with a rippled bilayer structure.3 If time allows, we will also compare with recent results on the formation of lipid nanodiscs (SMALP) by addition of styrene-maleic acid (SMA) polymers.4 In the presentation, we will discuss the mechanism behind the structural pathways and relate to the molecular structure.

1500-1545 From the laboratory to the market (The Case of A Low-cost Water Purification System, Nanofilter)

Askwar Hamanjida Hilonga

The Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha, Tanzania

We report a simple and reproducible method used to develop silver-doped silica powder with antibacterial properties suitable for developing a low-cost nanotechnology-based water filter trademarked as NanofilterTM. Silica matrices were synthesized via a sol–gel route which allows one to easily tailor textural and chemical properties. A wide range of silica-materials/products was obtained via the present route. These are: pure silver nanoparticles (Ag0), silver in ionic state (Ag+), AgCl nanoparticles, and the mixture of Ag0 and AgCl. The efficacy of these products were tested against Escherichia coli and the results demonstrate that materials that are suitable for antibacterial applications were obtained by this newly developed technique while utilizing sodium silicate, which is relatively inexpensive, as a silica precursor. This may significantly boost the industrial production of the inexpensive silver-doped silica nanomaterials for water purification. A project on innovative commercial application will also be reported. This project will demonstrate success story of Nanofilter: From the laboratory to the market.

1545-1615 Coffeebreak and discussions

1615-1630 Plateau-Rayleigh Instability in a Soft Viscoelastic Cylinder with Rigid Inner Core

Bharti Bharti, Andreas Carlson, Tak Shing Chan

Mechanics Division, Department of Mathematics, University of Oslo, Norway

Material like gels, rubber and biological tissues are soft solids, which responds with significant deformation under stresses. When length scale of the system is smaller than the elastocapilliary length, surface tension plays important role in soft solids and thus helpful in understanding wetting, adhesion and lubrication of soft solids. We study Plateau-Rayleigh (P-R) instability in a soft viscoelastic cylinder with rigid inner core. We solve governing equation for the deformation of soft solid and hence derive dispersion relation which describe the shape change modes. We present results how the P-R instability of soft cylinder depends on slip boundary condition, dimensionless elastocapilliary length, dimensionless cylinder radii, solid Deborah number.

1630-1645 A Twist On Active Membranes: Odd Mechanics, Spontaneous Flows and Shape Instabilities

Sami Al-Izzi

Mechanics Division, Department of Mathematics, University of Oslo, Norway

Living systems are chiral on multiple scales, from constituent biopolymers to large scale morphology, and their active mechanics is both driven by chiral components and serves to generate chiral morphologies. We describe the mechanics of active fluid membranes in coordinate-free form, with focus on chiral contributions to the stress. These generate geometric `odd elastic' forces in response to mean curvature gradients but directed perpendicularly. As a result, they induce tangential membrane flows that circulate around maxima and minima of membrane curvature. When the normal viscous force amplifies perturbations the membrane shape can become linearly unstable giving rise to shape instabilities controlled by an active Scriven-Love number. We describe examples for spheroids, membranes tubes and helicoids, discussing the relevance and predictions such examples make for a variety of biological systems from the sub-cellular to tissue level.

1645-1700 Static wetting of a barrel-shaped droplet on a soft-layer-coated fiber

Boxue Zheng, Christian Pedersen, Andreas Carlson, Tak Shing Chan

Mechanics Division, Department of Mathematics, University of Oslo, Norway

A droplet can deform a soft substrate due to capillary forces when they are in contact. We study the static deformation of a soft solid layer coated on a rigid cylindrical fiber when an axisymmetric barrel-shaped droplet is embracing it. We find that the elastic deformation increases with decreasing rigid fiber radius. Significant disparities of deformation between the solid-liquid side and the solid-gas side are found when their solid surface tensions are different. When the coated layer is soft enough and the rigid fiber radius is less than the thickness of the coated layer, pronounced displacement oscillations are observed. Such slow decay of deformation with distances from the contact line position suggests a long-range interaction between droplets on a soft-layer-coated fiber.

1700-1715 Sliding, vibrating and swinging droplets on an oscillating fibre

Stéphane Poulain, Andreas Carlson

Mechanics Division, Department of Mathematics, University of Oslo, Norway

We study experimentally the dynamics of a water droplet on a tilted and vertically oscillating rigid fibre. As we vary the frequency and amplitude of the oscillations the droplet transitions between different modes: harmonic pumping, subharmonic pumping, a combination of rocking and pumping modes, and a combination of pumping and swinging modes. We characterize these responses and report how they affect the sliding speed of the droplet along the fibre. The swinging mode is explained by a minimal model making an analogy between the droplet and a forced elastic pendulum.

1715-1730 Bacteria Motility in Laponite Suspensions

Andrew Akanno (*NTNU*), Renaud Baillou (*ESPCI*), Eric Clement (*ESPCI*), Jon Otto Fossum (*NTNU*)

NTNU - Soft and Complex Matter Lab, Department of Physics, NTNU, Norway
ESPCI - PMMH, ESPCI Sorbonne University, Paris France

The swimming behavior of bacteria in colloidal fluids is an interesting phenomenon that impact the ability of these tiny self-propelling organisms to travel and perform tasks, such as search for nutrients and create new colonies in their natural environments. Some intriguing motility behaviors that have been observed include enhanced bacteria swimming velocity, straightening of bacteria swimming trajectories, suppression of the bacteria tumbling motion as well as slow random walks. These behaviors are attributed to interactions of the bacteria and the colloidal fluid, which could result from the complex properties of the fluid or the fluid heterogeneities on the scale of the bacteria.

In this work, the properties of Laponite clay suspensions as a function of the clay concentration were studied using a Rheometer with the cone & plate geometry. Rheological measurements provide insights into the complex nature of colloidal fluids. Furthermore, the motion of E. coli bacteria was tracked in thin films of Laponite suspensions under the microscope using the 3D Lagrangian tracking system.

Here, we show that the rheology of Laponite suspensions strongly depends on concentration and time, and this strongly impacted the motion of the E. coli bacteria.

1730-1745 Structural coloration in water droplets containing suspended clay mineral nanosheets

Yue Yu, Paulo H. Michels-Brito, Jon Otto Fossum

Soft and Complex Matter Lab, Department of Physics, NTNU, Norway

Na-fluorohectorite (Na-FHt), a synthetic clay mineral which spontaneously forms nematic phases of single 1-nm-thick nanosheets when immersed into water, show structural coloration. In the present study, we demonstrate experimentally that a single acoustic levitated water droplet (with volume 4ul) containing clay DBL nanosheets ,which is two single nanosheets pinned together by Cs+, can easily and rapidly present structure coloration. The color changes during droplet evaporation as the clay DBL concentration increases.

Acknowledgements: Research Council of Norway project number 315135.

References:

Fossum, Jon Otto. "Clay nanolayer encapsulation, evolving from origins of life to future technologies." The European Physical Journal Special Topics 229 (2020): 2863-2879.

Paulo H. Michels-Brito, Volodymyr Dudko, Daniel Wagner, Paul Markus, Georg Papastavrou, Leander Michels, Josef Breu, Jon Otto Fossum ."Bright, noniridescent structural coloration from clay mineral nanosheet suspensions." Science Advances 8.4 (2022): eabl8147

1745-1815 Coffeebreak and discussions

1815-1830 Buckling of Pickering Layers

Negar Azizi, Jon Otto Fossum and Paul Gunnar Dommersnes

Soft and Complex Matter Lab, Department of Physics, NTNU, Norway

Pickering emulsions represent emulsions that find stability through particle stabilization instead of surfactants. Owing to capillary forces, small particles exhibit a preference for residing at the interface between two liquid phases. Consequently, droplets can become enveloped in a protective particle layer, effectively preventing neighboring droplets from merging. Pickering emulsions tend to exhibit stability but, they can become destabilized when subjected to mechanical agitation, such as stirring. This susceptibility can be attributed to activities like scratching or deformations that damage or rupture the protective Pickering layer. Therefore, recognizing the importance of investigating the behavior of a Pickering layer under the influence of mechanical forces from multiple directions, we have initiated compression experiments on monolayers comprised of microscopic particles at the water's surface. These experiments encompass three distinct sizes of polystyrene particles. Within this context, alterations in surface morphology, referred to as buckling, have been observed. Furthermore, we are presently at the preliminary stages of conducting analogous experiments utilizing clay, with the anticipation of generating novel outcomes.

References

Vella, D., Aussillous, P. and Mahadevan, L., 2004. Elasticity of an interfacial particle raft. Europhysics Letters, 68(2), p.212.

Jambon-Puillet, E., Josserand, C. and Protiere, S., 2017. Wrinkles, folds, and plasticity in granular rafts. Physical Review Materials, 1(4), p.042601.

1830-1845 Moringa Oleifera Proteins as Pickering Stabilizers

Namrah Azmi[1,2], Andrew Akanno[1], Matti Knaapila[1], Adrian Rennie[3], Leonard Rweyemamu[2,4], Jon Otto Fossum[1]

1 Soft and Complex Matter Lab, Department of Physics, Norwegian University of Science and Technology – NTNU, Trondheim, Norway
2 Stayfit Nutrisupplies Co. Ltd– Dar es Salaam, Tanzania
3 Department of Chemistry, Uppsala University, Sweden
4 Department of Food Science, College of Agriculture, University of Dar es Salaam – UDSM, Dar es Salaam, Tanzania

The chemical decay of food impacting the environment needs stabilization. Pickering emulsions stabilized by solid particles provide a picture of stable systems and they are thermodynamically stable and can be applied in food to control and enhance texture and taste and improve stability(1). Plant protein attracts attention and hence moringa protein, being an inexpensive, nutritional source(2) has been chosen as a Pickering stabilizer. Protein particle interactions are dependent on pH(3) which motivates us to fabricate emulsions at different pH and ionic strength. The rheology can be designed by arrested coalescence to produce food spread(4).

It is difficult to separate the association mechanism of gelation and emulsification through protein aggregation which is another motivation for our studies(5).

Rreferences:

1. Kargar, M., Fayazmanesh, K., Alavi, M., Spyropoulos, F. & Norton, I. T. Investigation into the potential ability of Pickering emulsions (food-grade particles) to enhance the oxidative stability of oil-in-water emulsions. J Colloid Interface Sci 366, 209–215 (2012).
2. Chen, L., Ao, F., Ge, X. & Shen, W. Food-grade pickering emulsions: Preparation, stabilization and applications. Molecules 25, (2020).
3. Tarhini, M. et al. Protein-based nanoparticle preparation via nanoprecipitation method. Materials 11, (2018).
4. Huang, Z. et al. Fabrication and stability of Pickering emulsions using moringa seed residue protein: Effect of pH and ionic strength. Int J Food Sci Technol 56, 3484–3494 (2021).
5. Zhu, Z. et al. Food protein aggregation and its application. Food Research International vol. 160 Preprint at https://doi.org/10.1016/j.foodres.2022.111725 (2022).

1845-1915 A physicist's look at Moringa seed proteins – understanding applications

Adrian R. Rennie

Uppsala University

The protein from seeds of various varieties of Moringa trees are attracting considerable attention in water purification and in food materials. Apart from a range of interesting properties, it can be produced commercially on a large scale. The presentation will briefly review what has been found in some recent studies of association and interactions with other materials related to these applications.

1915-1945 2D world in the Soft and Complex Matter Lab– clay, graphene and beyond

Barbara Pacakova[1], Marian Matejdes[2,3], Anupma Thakur[4], Nithin Chadran[4], Babal Anasori[4], Josef Breu[3], Jon Otto Fossum[1]

1 Soft and Complex Matter Lab, Department of Physics, NTNU
2 SAS Slovakia
3 Bayreuth University, Germany
4 IUPUI Indianapolis USA

Clays are one of the most abundant materials in the world. Among these, synthetic fluorohectorite or natural vermiculite clay can be exfoliated into the 1 nm thin nanosheets. As the sheets are negatively charged and keep positively charged cation in the interlayer, it bring svery huge opportunity to 'engineer' interlayers in the stacks of the clay sheets, and these heterostructures bring in many applications such as CO2 capture, and even formation of new 2D materials.

In this talk, we will show that it is possible to synthetize graphene and carbon nanotubes in the interlayer of clay under the very mild and sustainable conditions, using toxic dyes as a precursors. Moreover, we will turn attention to Mxenes, which is the novel material, with a little bit of exaggeration with the 'structure of clay and properties as graphene' and discuss how we can use Mxenes to determine amount of defects in any 2D conductive layer in general, using phenomena of weak localization.

1945-2000 Dscussions

2000-2200 Dinner

2200-2400 After dinner discussions/ Coffee etc

Saturday, 16 / September / 2023

0900-0930 Registration and discussions

0930-1000 Cellulose self-assembled systems: from molecular to the macro scale

Maria Helena Godinho

NOVA University Lisbon, Portugal

Cellulose is a natural polymer that can constitute the primary material at the origin of the formation of helicoidal systems that appear at plants' molecular, nano, micro, and macro scales [1]. These structures are responsible for structural coloration, enhanced mechanical properties, and motion. This presentation is concerned with molecular and nanoscale cellulose helicoidal arrangements. Emphasis is given to cellulose nanocrystals, water interactions, cellulose derivatives, and out-of-equilibrium colorful structures. So far, the results indicate that significant work is to be done on out-of-equilibrium systems. In addition, much must be learned from nature to produce novel helicoidal functional materials with unique optical and mechanical properties.

[1] Rafaela R. da Rosa, Susete N. Fernandes, Michel Mitov, and Maria Helena Godinho, Adv. Funct. Mater. 2023, 2304286, DOI: 10.1002/adfm.202304286

1000-1030 Electroactive Bi-functional Liquid Crystal Elastomer Actuators

Min-Hui Li

Institut de Recherche de Chimie Paris, CNRS, Chimie ParisTech, Université PSL, Paris, France

Liquid crystal elastomers (LCEs) show promising potentials as smart actuators. Direct heating and light illumination are the most used activation mode in LCE actuators because LCEs are based on thermotropic or phototropic liquid crystals. However, electrical energy is the most convenient and the most in demand stimuli. Indeed, the nature does use electrical impulses between nerves and muscles/skins for actuation/sensing with extraordinary efficacy, and electrical stimulation is also more widely utilizable as driving forces in industrial devices.
I will present a trilayer electroactive LCE (eLCE) by combining LCE and ionic electroactive polymer device (i-EAD), which is bi-functional and can perform either bending or contractile deformations under low voltage stimulation. By applying a voltage of ±2 V at 0.1 Hz, the redox behavior and associated ionic motion in the two conducting polymer electrodes of i-EAD provide bending deformation up to a bending strain difference of 0.8%. By applying a voltage of ± 6V at 10 Hz, the ionic current-induced Joule heating provokes 20% muscle-like linear contraction of the central ion-conducting LCE without load or lifting a load of 150 times of the eLCE weight. This approach of combining two smart polymer technologies (LCE and i-EAD) in a single device, is promising for the development of smart materials with multiple degrees of freedom in soft robotics, electronic devices, and sensors.

1030-1100 Active bacteria dispersion

Eric Clément, Thierry Darnige, *PMMH, ESPCI Sorbonne University, Paris France*
Gaspard Junot, *Dept of Condensed Matter Physics, University of Barcelona, Barcelona, Spain*

Using a Lagrangian tracking technique monitoring individual trajectories of motile wild-type E.coli in a rectangular channel, we characterize the mean dispersion process under flow. We show that the emerging longitudinal diffusion coefficient is proportional to the square of the flow rate, a result reminiscent of the classical Taylor-Aris scaling for molecular and colloidal species. However, the dispersion mechanism bears a very different physical origin inherently borne in the swimming activity and points on the central importance of the motility-dependent surface/bulk exchange mechanisms. Our results are quantified using a simple stochastic description of the transport processes.

1100-1130	Coffeebreak and discussions

1130-1200 Elastic vortices in active solids

Paul Dommersnes

Soft and Complex Matter Lab, Department of Physics, NTNU

Recent experiments show how epithelial monolayers can behave as self-propelled solid elastic membranes, and that global polar order emerges from the annihilation of contractile vortices and their anti-vortices [1]. The “active-elastic-solid” [2] is a simple model for polar ordering, which only involves isotropic elasticity (no nematic elasticity) and ordering through the principle: move in the direction of the local elastic force. I will show how this model can explain many of the observations in the epithelial monolayers, and in particular how elastic vortices can form, interact and annihilate.

References:

[1] Integer topological defect annihilations drive polar ordering of epithelial monolayers, E. Lång, A. Lång, P. Blicher, T. Rognes, P.G. Dommersnes, S. O. Bøe https://www.researchgate.net/publication/370828233_Integer_topological_defect_annihilations_drive_polar_ordering_of_epithelial_monolayers
[2] Ferrante, E., Turgut, A. E., Dorigo, M., Huepe, C. Elasticity-based mechanism for the collective motion of self-propelled particles with springlike interactions: a model system for natural and artificial swarms. Phys. Rev. Lett. 111, 268302 (2013)

1200-1230 Magnetic Quincke Rollers

Jaakko V. I. Timonen, Ricardo Reyes Garza, Nikos Kyriakopoulos, Zoran M. Cenev, Carlo Rigoni

Department of Applied Physics, Aalto University School of Science, Espoo, Finland

Electrohydrodynamically driven active particles based on Quincke rotation have quickly become an important model system for emergent collective behavior in non-equilibrium colloidal systems.[1] Like most active particles, Quincke rollers are intrinsically non-magnetic, preventing the use of magnetic fields to control their complex dynamics on-the-fly. Here, we report on magnetic Quincke rollers based on silica particles doped with superparamagnetic iron oxide nanoparticles.[2] We show that their magnetic nature enables the application of both externally controllable forces and torques at high spatial and temporal precision, leading to several new control mechanisms for their single particle dynamics and collective states. These include tunable interparticle interactions, potential energy landscapes, and advanced programmable and teleoperated behaviors - allowing us to discover and probe active chaining, anisotropic active sedimentation-diffusion equilibria and collective states in various geometries and dimensionalities.

References

[1] Bricard et al., Nature 503, 95-98 (2013).
[2] Reyes Garza et al., Science Advances 9, adh2522 (2023)

1230-1300 Microfluidic stories

Patrick Tabeling

ESPCI-PSL, Paris, France

Two questions will be addressed during the presentation: physics of surface tension and nanoparticule formation

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1300-1310 Closing remarks

Jon Otto Fossum

Soft and Complex Matter Lab, Department of Physics, NTNU, Norway

1310-1400 Lunch

1400-1500 After lunch discussions / Coffee

List of Participants

Name	Affiliation
Adrian Rennie	Uppsala University
Andreas Carlson	University of Oslo
Andreas Holand	NTNU, Norway
Andrew Akanno	NTNU, Norway
Arne Skjeltorp	Giamag, Norway
Askwar Hamanjida Hilonga	The Nelson Mandela African Institutuion for Science and Technology, Arusha, Tanzania
Barbara Pacakova	NTNU, Norway
Bharti Bharti	University of Oslo, Norway
Boxue Zheng	University of Oslo, Norway
Eric Clement	ESPCI-Sorbonne, Paris, France
Geir Helgesen	Institute for Energy Technology, Norway
Jaakko Timonen	University School of Science, Finland
Jon Otto Fossum	NTNU, Norway
Kenneth D. Knudsen	Institute for Energy Technology, Norway
Kristoffer Hunvik	Forsvarets forskningsinstitutt, Norway
Larysa Anisimova	Institute of Geotechnical Mechanics named by N. Polyakov NAS of Ukraine
Leide Cavalcanti	ISIS Neutron Source, UK
Min-Hui Li	Institut de Recherche de Chimie Paris, CNRS, Chimie ParisTech, Université PSL, Paris, France
Maria Helena Godinho	NOVA University Lisbon, Portugal
Namrah Azmi	NTNU, Norway
Negar Azizi	NTNU, Norway
Patrick Tabeling	ESPCI-PSL, France
Paul Dommersnes	NTNU, Norway
Reidar Lund	University of Oslo, Norway
Sami Al-Izzi	University of Oslo, Norway
Stéphane Poulain	University of Oslo, Norway
Tak Shing Chan	University of Oslo, Norway
Yue Yu	NTNU, Norway