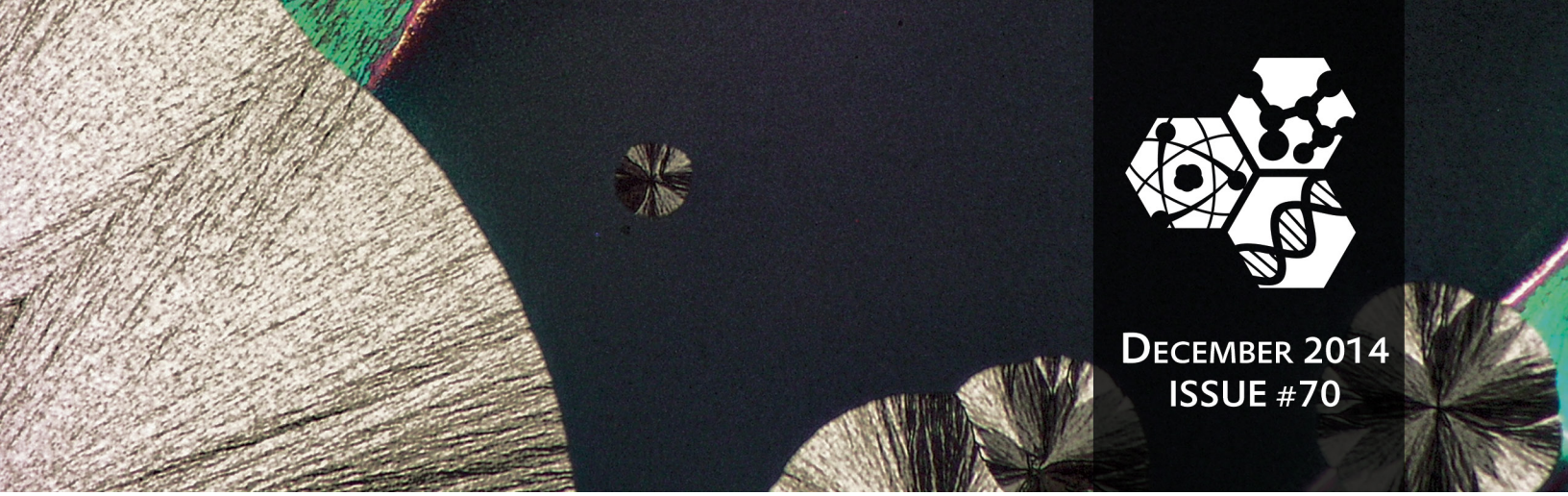

DECEMBER 2014
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Dear Soft Matter Colleagues,

Happy holidays soft matter colleagues, We hope you have an enjoyable winter break and a happy new year - looking forward to an outstanding 2015!

FAILED ESCAPE: SOLID SURFACES PREVENT TUMBLING OF E. COLI.

M. Molaei, M. Barry, R. Stocker, and J. Sheng. Physical Review Letters 113.6 (2014)

Improving our understanding of bacterial motility is crucial to developing the best and safest applications in bioengineering and medicine. Specifically, understanding bacterial interactions close to surfaces will have an influence on the development of sterile materials for medical equipment in addition to improving methods for creating biofilms and bacterial formations.

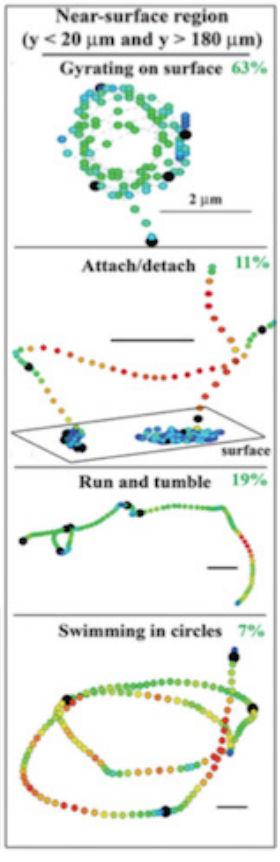
Using Digital Holographic Microscopy (DHM), Medhi Molaei in the Mechanical Engineering Department of Texas Tech University in collaboration with MIT –Ralph M. Parson's Laboratory - were able to observe the movement (Run & Tumble) of wild-type e. coli when in the presence of a close surface. Their research has shown that: 1) DHM is a useful technique for observing small bacteria, which has mainly been used to observe bigger microorganisms, but importantly 2) demonstrate how hydrodynamic forces have an effect on e. coli flagella by reducing tumbling by 50% within 20μm of a surface. Understanding these mechanisms should have a positive effect on how further biomedical research and engineering of materials prone to biofouling will be done.

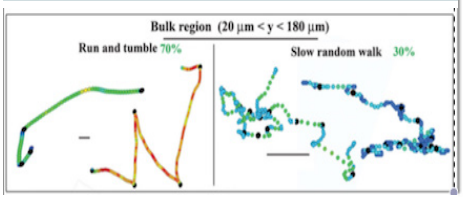
Tumbling is essentially an adaptive method used by bacteria with flagellum that allows them to reorient themselves by abruptly changing the direction of the flagellum's original spin. When the tumbling is accomplished and the flagellum spins normally it produces torque in order to push forward in a straight "run." Using a microfluidic channel, the wild-type E. Coli were observed using DHM's 3-D imaging to measure concentration and motion throughout the channel. This contributed to data corresponding to reorientation of angle change and overall run and tumble time. This data was compared to other e. coli in the same channel that was at least 20μm away from a surface. Figure 1 provides a visual of different swimming trajectories and the percentage of bacteria following those movements when in bulk (>20 μm) or in a near surface region (<20 μm).

The wild-type e. coli has adapted other means of reacting to environmental cues by using its flagella to reorient and move around through a series of run and tumbles. Molaei's team have demonstrated that the effects on bacterial tumbling can be immensely hindered by the simple presence of a surface within a range of 20 μm by 50%, and even in the case that tumbling does occur, the reorientation is fairly minimal. Biomedical research and engineering can greatly benefit from this effect as it can prevent infections in patients that are in need of implants or be used to produce specific bacterial formations. In addition, the research group speculate on similar results with other bacteria with or without flagella.

You can read the full paper here.

- Mike Facio





▶ *Figure 1 - Swimming trajectories. The swimming trajectories of e. coli found near a surface region tend to have a higher percentage stuck near the surface. Although there is still movement, the trajectories do not allow escape. The swimming trajectories found in the bulk region are undisturbed by any hydrodynamic effects and move freely.*

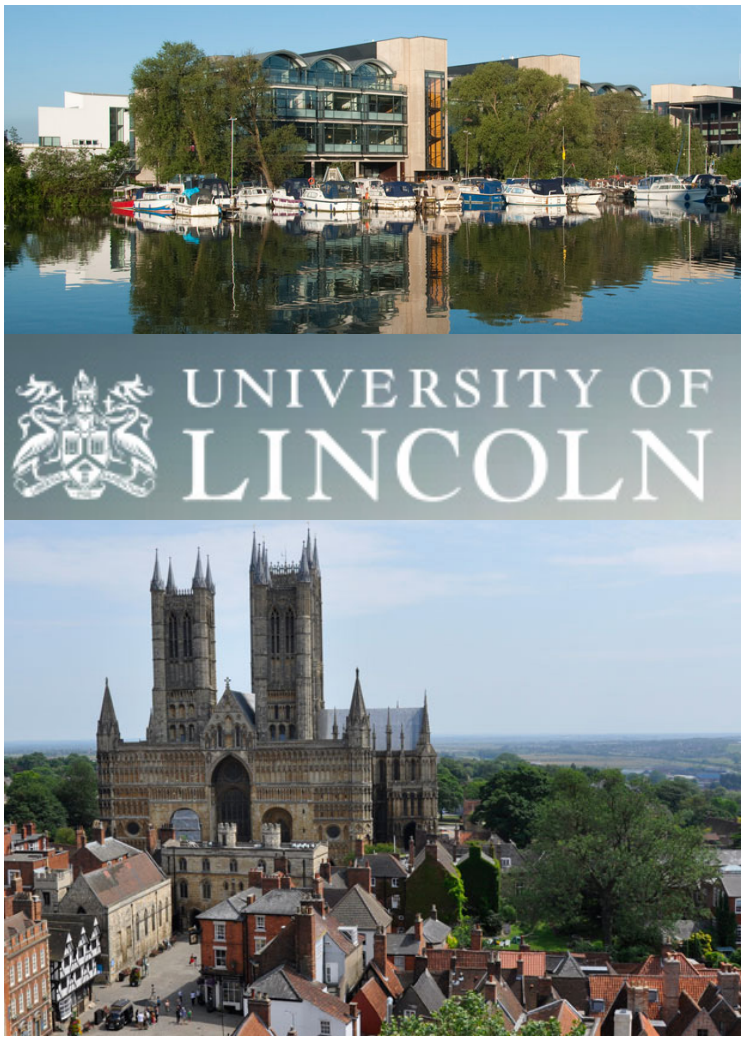
A new centre for Computational Soft Matter in the UK

New school of physics and mathematics founded, Lincoln, UK

A new school of mathematics and physics opened in September 2014 at the University of Lincoln in the UK, in the latest stage of an ambitious plan to expand the university's research presence. Lincoln is just 50 km from the birthplace of Sir Isaac Newton, and it was already prominent in Roman times as Lindum Colonia, and became the centre of the largest diocese in medieval England and home to the most magnificent Gothic cathedral in UK. It also hosts one of just four copies of Magna Carta, which is considered to be the greatest constitutional document of all times. In spite of this rich history Lincoln became a university city only recently. The new school will carry out research and offer undergraduate and postgraduate physics and mathematics degrees. "We are investing heavily in interdisciplinary science, including at the interface between life sciences, chemistry and physics, and we need a full spectrum of subjects for this to be effective," says Professor Andrew Hunter, Lincoln's pro vice chancellor.

The school is headed by Professor Andrei Zvelindovsky – a computational soft matter physicist who was previously at the University of Central Lancashire in Preston, UK. Andrei moved to Lincoln with his group, which also includes two young faculty members: Dr Marco Pinna, who won the UK Institute of Physics PhD Thesis Prize in Computational Physics in 2009 for his work on mesoscale modelling of block copolymer systems and Dr Manuela Mura, who was awarded the Tadion-Rideal Prize for Molecular Science 2010 from King's College London for her PhD thesis on the understanding of mechanisms of the self-assembly of nano-structures from flat organic molecules, such as derivatives of DNA, on metal surfaces.

Andrei's vision is to develop the school in one of UK largest research centres in computational soft matter with the special emphasis on the nanostructured soft matter and its interfaces with other fields. In spring 2015 the school will appoint two more faculty members with the aim bring the number of permanent academics in computational soft matter up to 15 in three years.



Faculty positons

Is your school hiring in soft matter? Target hundreds of potential applicants by sending your job advertisement to us and we will post it for free!

submissions to the editor at editor@softmatterworld.org

Chirality at the Nanoscale

Symposium at Kent State University - June 4-5th 2015

This upcoming workshop will bring researchers from two fields together that explore the unique optical activity (chirality) of either metal and semiconductor nanomaterials or soft condensed matter such as liquid crystals. Research at the interface between liquid crystal and nanomaterials is considered one of the new frontiers and has produced new chemistry, physics, devices as well as prototypes for meta materials. Significant new effects and transformative research is expected if this interface includes chirality. Together with leaders in the respective fields this workshop will explore current and future synergies of chirality at the nanoscale.

Registration is not open yet but more detail can be found at the meeting website, http://www.lcinet.kent.edu/conference/25/index.php where you can pre-register for the meeting.

KENT STATE UNIVERSITY
Liquid Crystal Institute

This symposium is part of the Celebration of the 50th Anniversary of the Liquid Crystal Intitute at Kent State University (1965 - 2015).

CISM Summer School - Mechanics of Solid and Liquid Foams

July 13 - 17, International Center for Mechanical Sciences, Udine, Italy

This summer the International Center for Mechanical Sciences at Udine, Italy wil host a summer school about the mechanical properties of solid and liquid foams.

This course will focus on the relationships between the cellular microstructure and the nonlinear mechanical behavior of liquid and solid foams, and foam-like biological and synthetic materials. Consequently, this survey of foam mechanics will explore numerous topics ranging from traditional fluid mechanics to solid mechanics. Theoretical analysis, numerical simulations, and experiments will be used to unravel the complex relationships between cell-level structure, local deformation mechanisms, and macroscopic mechanical behavior.

The school has posted a detailed flier describing the program here. You can also learn more about the The International Center for Mechanical Sciences on thier website.

Calendar competition - deadline Extended to Dec 31st!

Good news - there is still plenty of time to submit your images to the 2015 calendar competition. We have recieved quite a few entries already but there is still a chance to take part. Submit your entries by Dec 31st to be considered. See the website instructions page for more details.

Thanks for reading

Linda Hirst and The SoftMatterworld Team