

ERC-funded PhD positions: Self-Assembly of Colloidal Structures in Living Liquid Crystals

Job Ref: ERC-851196

Four fully funded PhD studentships in Self-Assembly of Colloidal Structures in Living Liquid Crystals are available in the Intradisciplinary Centre for Mathematical Modelling at Loughborough University with Dr Tyler Shendruk.

Project:

We are seeking computational physics/applied mathematics students, who are interested in simulating intrinsically out-of-equilibrium soft materials. Biological matter is wonderfully complex — it can often flow like a liquid, orient like a liquid crystal, spontaneously move, and produce dynamic structures on multiple scales. These are exciting properties that passive and man-made materials typically do not possess.

This project will investigate the dynamics of colloids embedded in active fluids, biological fluids that spontaneously flow due to internal energy. The interdisciplinary basis of this project leverages recent discoveries in the fields of active matter and colloidal liquid crystals to realize otherwise impossible pathways to dynamics self-assembly of mesoscale structures. This project consolidates these three exciting avenues of research. PhD researchers will develop and use novel numerical algorithms to study biomimetic fluids composed of passive elements suspended in a spontaneously flowing liquid crystal. They will investigate the interactions and dynamics of passive colloids, exploring whether pairs of colloids form self-assembled dimers and investigating whether many small colloids form a whirling halo around a larger, counter-spinning colloid (see [figure](#)). Researchers will develop mathematical models and algorithms to understand the self-assembly of such colloidal structures. Group members work in a collaborative and intradisciplinary environment, and become familiar with cutting-edge modelling techniques over the course of their research. Research responsibilities include developing mathematical models and numerical simulations to understand the self-assembly in active matter. Applicants should have experience with numerical modelling. A relevant Master's degree and/or experience in biophysics, hydrodynamics, soft condensed matter physics and non-equilibrium dynamics will be considered an asset. Applicants possessing experience with molecular dynamics, lattice-Boltzmann or other coarse-grained simulations are strongly encouraged to apply, as are skilled programmers. We are particularly eager to see diverse applicants who demonstrate creativity, and an eagerness to computationally model exciting and dynamic systems.

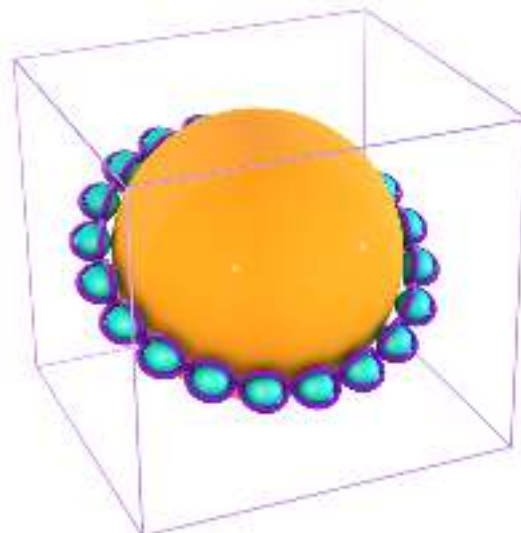


Figure: Proposed structure of colloids suspended in an active fluid.

Information:

Stipend: £14,777 per annum (tax-free) plus tuition fees (UK/EU rate)

University: Loughborough University

Supervisor: Tyler Shendruk

Start date: 1 Jan 2020

Duration: 3 Year PhD

Apply by: 2 Dec 2019

Qualifications:

Applicants should have, or expect to achieve, at least a 2:1 Honours degree (or equivalent) in Physics, Computational Science or a related subject. A relevant Master's degree and/or experience in one or more of the following will be an advantage: Numerical simulations, programming, biophysics, hydrodynamics, soft condensed matter physics, non-equilibrium systems.

School Summary:

Loughborough University is a top-ten rated university in England for research intensity (REF2014). In choosing Loughborough for your research, you'll work alongside academics in the Interdisciplinary Centre for Mathematical Modelling who are leaders in their field. You will benefit from comprehensive support and guidance from the School of Science and Graduate School.

Further Information at:

<https://www.lboro.ac.uk/media-centre/press-releases/2019/october/funding-to-design-living-micro-machines/>.

How to Apply:

Interested applicants are encouraged to contact Dr. Shendruk directly (t.n.shendruk@lboro.ac.uk). Applicants will be asked to provide a CV, personal statement (describing research interests), and two letters of recommendation.

Contact Information:

Tyler Shendruk
Interdisciplinary Centre for
Mathematical Modelling
Mathematical Sciences
Loughborough University
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Sincerely,

A handwritten signature in black ink, appearing to read 'Tyler Shendruk', with a long, sweeping horizontal stroke extending to the right.

Tyler Shendruk