

## Fully funded PhD position: Self-Assembly of Colloidal Structures in Living Liquid Crystals

Job Ref: TS/MA/2019

A 3-year PhD studentship in Self-Assembly of Colloidal Structures in Living Liquid Crystals is available in the Intradisciplinary Centre for Mathematical Modelling at Loughborough University with Dr Tyler Shendruk.

### Project:

We are seeking a computational physics/applied mathematics student, who is interested in simulating intrinsically out of equilibrium soft materials. This project will investigate the dynamics of colloids embedded in active fluids, biological fluids that spontaneously flow due to internal energy. Biological matter is wonderfully complex — it can often flow like a liquid, orient like a liquid crystal, spontaneously move, and produces dynamic structures on multiple scales. These are exciting properties that passive and man-made materials typically do not possess. 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.

The PhD student will develop and use novel numerical algorithms to study biomimetic fluids composed of passive elements suspended in a spontaneously flowing liquid crystal. You will investigate whether pairs of colloids form self-assembled dimers that function as a self-propelled rotor. You will explore whether many small colloids form a whirling halo around a larger, counter-spinning colloid (see [figure](#)). Your role will be to develop mathematical models and algorithms to understand the self-assembly of such colloidal structures. You will be working in a collaborative and intradisciplinary environment, and will become familiar with cutting-edge modelling techniques. Your role will be to develop mathematical models and numerical simulations to understand the self-assembly in active matter. Applicants should have experience with or show enthusiasm to learn numerical modelling. We are particularly eager to see diverse applicants who demonstrate creativity, and an eagerness to computationally model exciting and dynamic systems.

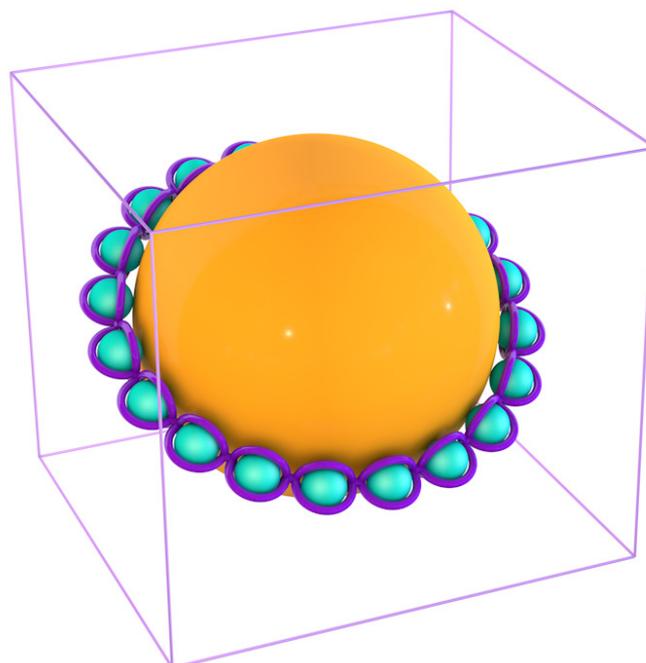


Figure: Proposed structure of colloids suspended in an active fluid.

**Information:**

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

**University:** Loughborough University

**Supervisor:** Tyler Shendruk

**Start date:** Oct 2019

**Duration:** 3 Year PhD

**Apply by:** 15 Feb 2019

**Qualifications:**

Applicants should have, or expect to achieve, at least a 2:1 Honours degree (or equivalent) in Physics, Applied Mathematics or a related subject. A relevant Master's degree and/or experience in one or more of the following will be an advantage: Statistical physics and thermodynamics, classical field theory, hydrodynamics, condensed matter physics, non-equilibrium systems, stochastic processes, molecular dynamics simulations, programming with C and python.

**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/science/study/postgraduate-research/studentships/>.

Search "**Living Liquid Crystals**"

**How to Apply:**

Interested applicants are encouraged to contact Dr. Shendruk ([t.n.shendruk@lboro.ac.uk](mailto: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 horizontal flourish extending to the right.

Tyler Shendruk