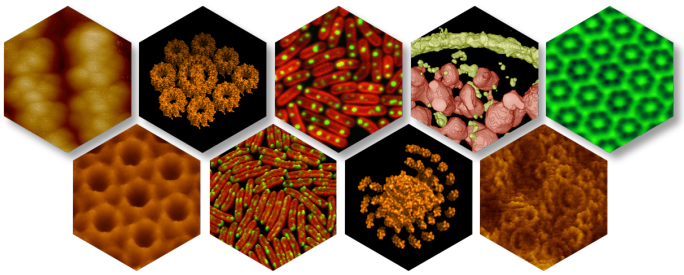
Institute of Integrative Biology University of Liverpool



THE ROYAL SOCIETY

4-year Fully-Funded PhD studentship in Biochemistry/Biophysics

Nanomechanics of bacterial carbon-fixation organelles

Application eligibility: UK/EU Students **Start date: October 2018**

Description of the project:

Bacterial microcompartments are nano-scale organelles found in many bacteria, which are formed by the self-assembly of hundreds of proteins and molecules into one well-defined structure. They are of great importance in enhancing specific metabolic reactions. Understanding how these organelles are formed and maintained in the cell is vital for the engineering of functional organelles. How do cells manage to assemble many hundreds of proteins into one complex structure with efficient metabolic functions? How do different building blocks contribute to the self-assembly and whole-organelle functionality? What are the intrinsic mechanical properties of these 3D structures?

This PhD project will unravel the biomechanical principles of bacterial microcompartments, termed carboxysomes, which are essential for carbon fixation. We will use state-of-the-art microscopy technique named **atomic force microscopy**, combined with **molecular genetics**, **biochemistry** and **synthetic biology**, to determine the biomechanics during the structural deformation of the organelles and the self-assembly process of individual proteins at the molecular resolution. By doing so, we will achieve the mechanical "fingerprints" of natural and designed organelles and eludicate how these structural building blocks assemble in a controllable manner to form and stabilize the entire organelles. Our goal is to provide essential information to guide the design, engineering and the ultimate manipulation of metabolic factories in a predictive context. The research outputs will have broader applications in the field of self-assembling organelles and protein engineering to generate new nanoreactors and scaffolding biomaterials. Lessons learned from this biological system are also instrumental to studies in physics, chemistry, nanotechnology and bioengineering.

The project will start in **October 2018**. It is a full 4-year funding for UK/EU nationals, covering stipend at RCUK rate (£14,553 per annum for 2017-2018), tuition fees, research and training costs. Training in all aspects of the project will be provided with access to state-of-the-art infrastructure in the University and with collaborators in the UK, Europe, US, Australia and China, which means that there will be good opportunity for career development.

How to apply:

Highly motivated and intelligent applicants with experience in biochemistry, biophysics, nanotechnology or relevant areas are encouraged to contact Dr Luning Liu (luning.liu@liverpool.ac.uk, www.luningliu.org) for details and apply for the studentship. Experience in electron and atomic force microscopy would be an advantage. Review of applications will begin on **6 March, 2018** and continue until a suitable candidate is identified. Application with CV, a cover letter and contact information of two referees should be sent to Dr Liu (luning.liu@liverpool.ac.uk). The candidates' motivation, skills and qualifications for the project should be described in the application.

References: Nanoscale, 2017, 9:10662-10673; Nano Letters, 2016, 16: 1590-1595; Plant Physiol, 2016, 171(1): 530-541; Science, 2017, 356(6344): 1293-1297; Nature, 2014, 513(7519): 547-550; Cell, 2013, 155(5): 1131-1140; PNAS, 2012, 109(2): 478-483; Science, 2010, 327(5970): 1258-1261.