Institute of Integrative Biology



2-year Postdoctoral Associate

Liu Lab (www.luningliu.org), University of Liverpool, United Kingdom

Deciphering self-assembly and organisation of bacterial organelles

for bioinspired engineering

Period of the project:	1 March 2019 – 28 February 2021 (full-time)
Salary:	£33,518 p.a.
Application deadline:	6 January 2019
Interview date:	21 January 2019

Project description

Many cellular processes are driven by multi-protein complexes in which proteins with similar functions assemble and work together. A particular paradigm in microorganisms is the carboxysome, a nanoscale organelle for CO₂ fixation in bacteria called cyanobacteria and chemoautotrophs. The carboxysome comprises thousands of protein peptides that assemble in space. Recently, carboxysomes have drawn increasing attention from bioinspired design and engineering for biotechnology applications. However, the actual stoichiometry of carboxysome components and how the building blocks are defined in carboxysomes are still the open questions in this field. This project builds on our expertise and recent breakthroughs in carboxysome biosynthesis and bioengineering and will use state-of-the-art microscopy, proteomics and synthetic biology to characterise in-depth the structural principles and variations of carboxysomes to cope with environmental variations. The study will provide direct experimental evidence for addressing how active carboxysomes are formed. Α complete understanding of carboxysome structure and formation will spur the bioengineering of function robust organelles for metabolic enhancement and the generation of new protein cages. The knowledge and techniques developed in the study will broadly impact studies and bioengineering of other self-assembling protein complexes and organelles.

The Liu Lab at the University of Liverpool aims to explore the molecular basis underlying the organisation, self-assembly and functional regulations of biological machineries. The long-term research interests of the Liu Lab are centred on the synthetic engineering of new biological "devices" to power cellular metabolism and providing biotechnological solutions to grand challenges such as global food and energy security.



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Responsibilities and Duties

- The day-to-day running of the project under the direction of the supervisor.
- Be responsible for molecular genetics experiments to set up genetically modified constructs and genotyping with the support of a technician.
- Apply and develop biochemistry and proteomics techniques to study carboxysomes.
- Apply and develop high-resolution fluorescence and electron microscopic imaging.
- Contribute to the implementation of the project, ensuring that milestones and deadlines are achieved, and that work is completed on time and within budget.
- Participate in collaborative projects and communication with collaborators.
- Plan and deliver high-quality research.
- Analyse/interpret data and make a significant input to the directions of the project.
- Keep abreast of current developments in the field by conducting literature searches.
- Prepare and present regular reports on research progress.
- Provide clear and timely written work, producing reports and publishing in high-profile journals and communicate verbally as required with other members of the University and with collaborators.
- Attend meetings and conferences as agreed by the project leader, including national and international levels and outreach activities.
- Play an active role in the research group, participating in group meetings and discussions.
- Participate in advising and training other postdocs, PhDs, the technician and students associated to the project.
- Any other duties appropriate to the post and grade that may be reasonably requested.

Application

Highly motivated applicants with a PhD degree in microbiology, molecular biology, biochemistry or equivalent are encouraged to apply. Please contact Dr Luning Liu (luning.liu@liverpool.ac.uk, www.luningliu.org) for details and send a CV and a cover letter at your earliest convenience.

References: Plant Physiology 2018, in press; Frontier Plant Sci 2018, 9:739; Mol Plant, 2017, 10:1434; Nanoscale, 2017, 9:10662; Science, 2017, 356:1293; Nano Lett, 2016, 16:1590-5; Plant Physiol, 2016, 171:530-41; Trends Plant Sci, 2013, 18:277; Nature, 2014, 513:547; Cell, 2013, 155:1131; PNAS 2012, 109:11431; PNAS 2011, 108:9455; Science, 2010, 327:1258-61.

