



Fully funded BBSRC DTP PhD Studentship 2024-2028

Synthetic engineering of cyanobacterial CO₂-concentrating mechanisms for enhanced carbon assimilation

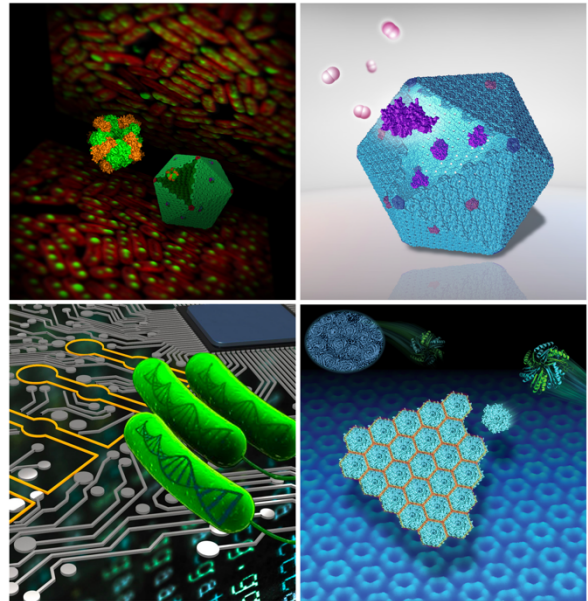
Primary supervisor: Professor Luning Liu (University of Liverpool, www.luningliu.org)

Co-supervisors: Dr Maxim Kapralov (Newcastle University), Dr David Kim (CyanoCapture)

Research background

Climate change is real and constantly reported in the popular press. There is a pressing need for innovative carbon capture technology to reduce the growing greenhouse gas emissions, especially carbon dioxide (CO₂), thereby mitigating climate change, supporting carbon-intensive industries, and transitioning to a low-carbon economy.

Cyanobacteria are one group of the most ancient and ubiquitous microorganisms on the planet. Cyanobacteria house the highly energy-efficient photosynthetic and carbon assimilation mechanisms, allowing them to play a significant role in global carbon fixation and primary production. Therefore, cyanobacteria represent great organisms in biotechnological applications. On the other hand, due to their highly adaptable carbon-fixing capabilities, cyanobacteria can thrive in a wide range of environments. Such adaption and flexibility make it challenging to manipulate and maximise the photosynthetic capacities of cyanobacteria, in a precise and controllable manner, in various applications.



Aims

This PhD studentship will harness the power and modularity of cyanobacteria carbon-assimilation systems as well as the emerging synthetic biology tools, to engineer cyanobacteria to be highly productive, controllable, scalable, and sustainable for underpinning biomass and biofuel production. To achieve this aim, we will establish genetic engineering approaches to manipulate carbon-assimilation mechanisms in fast-growing cyanobacteria and optimise individual carbon-assimilation modules leveraging the knowledge developed from computational modelling and machine learning. The genetically modified cyanobacterial strains will be extensively characterised by photosynthetic assays and metabolomic analysis, and will be tested in scaling-up conditions for enhanced carbon capture at a controllable and sustainable fashion. The long-term goal of the study is to provide new working organisms and solutions with the potential to reduce the energy consumption and cost of CO₂ capture as well as improve biomass and clean energy production.

Training

This highly interdisciplinary project represents the joint efforts of the research groups at the University of Liverpool and Newcastle University and the industrial partner, CyanoCapture (www.cyanocapture.com). By working in these internationally recognised institutions and collaborating with CyanoCapture through placement and visits, the PhD student will have access to state-of-the-art research facilities at the host institutions and gain enormous training and experience in synthetic biology, molecular genetics, biochemistry, microbiology, metabolomics, bioinformatics, *in silico* approaches, and scaling-up technology for industrial applications. The student will also join in wide collaborations across the UK, Europe, Australia, US, and China. Training in all aspects of the project will offer great opportunities for building strong academic and industrial networks and the student's career development.



Funding Notes:

The project is intended to start in October 2024. The fully-funded 4-year studentship will be offered to UK/EU/International students whose background and experience most fits the project. The studentship will provide tuition fees and an annual stipend allowance at UKRI rates, currently £18,662 per annum for 2023-24 on a full-time basis, in addition to research and training costs.

Selection Requirements:

We invite applications from highly motivated students in molecular biology, biochemistry, microbiology, biotechnology, or a related subject. The applicants should hold, or be about to obtain, a First or Upper Second class Honours degree, or the equivalent qualification gained outside the UK. As competition is fierce, many of our applicants also hold a Masters-level qualification. The applicants should have a demonstrated ability to work in a laboratory environment.

The deadline for studentship application is **Monday 15th January 2024**. You are encouraged to contact by email to discuss the project details at early as possible. Detailed research activities are available on the lab website: www.luningliu.org.

To apply for the studentship, please send your CV and a cover letter with contact information of two referees to Prof Luning Liu (luning.liu@liverpool.ac.uk).

References

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