Title

Using cold adapted photobionts to improve photosynthesis in economically important organisms

Value of award
Full UK/EU fees (eligibility criteria applies to EU students) and annual living allowance of £14,777 (at the 2018/19 UKRI rate)

Number of awards
1

Start date and duration
September 2019 for 3.5 years

Application closing date
31st January 2019

Overview
Interested in saving the planet and solving global food security while learning synthetic and organismal biology and biochemistry?

An exciting opportunity has arisen for a fully funded PhD. We are looking for a dynamic, ambitious research student to work with us on an innovative project: using cold adapted photobionts to improve photosynthesis in economically important organisms.

Photosynthesis, the most important biological process on a planetary scale, is surprisingly inefficient: less than 5% of solar energy is transformed into sugars. Increasing photosynthesis efficiency of economically important plants and algae offers potential solutions for future global food and energy security.

A major bottleneck in photosynthesis is the performance of the bifunctional CO₂ fixing enzyme, ribulose-1,5-bisphosphate carboxylase-oxygenase (Rubisco). Under present-day atmospheric conditions, the Rubisco oxygenase activity redirects carbon and energy in an unproductive way. Reducing the Rubisco oxygenase reaction will play a central role in improving photosynthetic performance and increasing global crop yield. Our recent advances in understanding requirements for Rubisco assembly and its heterologous expression in prokaryotic and eukaryotic hosts call for wider surveys of Rubisco diversity that could harbour more efficient enzymes than could replace less efficient crop ones.

Plant Rubiscos represent 'the tip of the iceberg'. We propose to investigate a critically understudied part of the 'submerged iceberg': Rubiscos from cold adapted aquatic algae and bacteria, which dominate marine and glacial environments in polar regions. Some Rubiscos from psychrophilic (cold loving) organisms could be used to improve photosynthesis in crops because of high selectivity for CO₂ and low sensitivity for O₂.

Objectives:
1. Find and characterise new Rubiscos from psychrophilic organisms.
2. Achieve heterologous expression of newly found psychrophilic Rubiscos.
3. Investigate the dynamics of engineered bacterial and algal populations grown at pilot laboratory scale.

**Sponsor**
Engineering and Physical Sciences Research Council (EPSRC).

**Name of supervisor(s)**
School of Natural and Environmental Sciences: Dr Maxim Kapralov, Dr Jon Telling, Dr Gary Caldwell; School of Engineering: Dr Dana Ofiteru.

**Eligibility Criteria**
Home students and UK residents of over 3 years. You must have, or expect to achieve, at least a 2:1 honours degree or international equivalent, in biology, biotechnology, microbiology, (bio)chemical engineering, or a related subject. You will require enthusiasm, initiative and an ability to undertake both experimental and computational research.

**How to apply**
You must apply through the Newcastle University online postgraduate application system.
- create a new account
- insert the programme code **8020F** in the programme of study section
- select PhD BIOL (FT) as the programme of study
- insert the studentship code **NES012** in the studentship/partnership reference field
- attach a covering letter and CV. The covering letter must state the title of the studentship, quote reference code **NES012** and state how your interests and experience relate to the project
- attach degree transcripts and certificates and, if English is not your first language, a copy of your English language qualifications.

You should also send your covering letter and CV to Dr Maxim Kapralov by email.

**Contact**
maxim.kapralov@ncl.ac.uk