

## Environmental Perception in Motile Diatoms

### Supervisory Team

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### Scientific background

Estuaries are important marine habitats exhibiting high levels of biodiversity. Diatoms are single-celled marine algae that are major primary producers in estuarine environments, where their success is underpinned by their ability to glide, moving through the sediment in response to changes in light or nutrients. Although this process is central to diatom ecophysiology, little is known about the underlying signalling processes that allow diatoms to sense and respond to key environmental cues.

This project will examine how diatoms sense light, nutrients and other stimuli and translate these stimuli into motile responses. The overarching aim is to examine the mechanisms through which motile responses are determined by diatom physiology and therefore underpin their ecological success.

Gliding motility in diatoms is regulated by calcium signalling and we have recently developed techniques to measure cytosolic calcium in the model diatom *Phaeodactylum tricornutum* using genetically encoded fluorescent biosensors. Development of these exciting technologies and their application to other diatom species will be an important aspect of the project.

### Approach:

The project will use state of the art technologies to study cell signalling in diatoms in response to different environmental stimuli. The aims of the project will be 1) to determine the calcium-dependent signalling processes underpinning motility, 2) to examine the cellular mechanisms of motility acting downstream of calcium signalling, 3) to determine how cell physiology influences the nature of motile responses. The project will feature extensive use of live cell imaging, both video microscopy tracking of single cells and fluorescent microscopy of diatom cells expressing genetically encoded calcium reporters. The project will also employ the advanced molecular techniques now available in diatoms to generate strains expressing additional fluorescent biosensors or for targeted gene knockout of potential signalling pathways.

### Training

The successful student will be based at the Marine Biological Association in Plymouth, where they will receive extensive training opportunities in laboratory techniques, including algal growth and physiology, advanced microscopy (including single cell imaging) and molecular techniques including development of transgenic diatoms strains.

### Person specification

We are looking for a highly motivated student with a strong interest in algal biology and ecophysiology. The project will primarily suit candidates with a degree in biology, biochemistry and/or molecular biology but candidates with other relevant experience will also be considered.

### References

Helliwell K.E., Chrachri A., Taylor A., Koester J., Wharam S., Wheeler G., & Brownlee C. Novel classes of voltage-gated Na<sup>+</sup> and Ca<sup>2+</sup> channels play important signalling roles in unicellular eukaryotes. In review.

Wheeler G., Helliwell K. E., & Brownlee C. Calcium Signalling in Algae. Perspectives in Phycology. DOI: 10.1127/pip/2018/0082.

Bondoc G., Heuschele J., Gillard J., Vyverman W. & Pohnert G. (2016) Selective silicate-directed motility in diatoms.. Nature Communications 7,10550.

McLachlan DH, Underwood GJC, Taylor AR, Brownlee C (2012) Calcium release from intracellular stores is necessary for the photophobic response in the benthic diatom *Navicula perminuta* (Bacillariophyceae). Journal of Phycology 48, 675-681.

Bohórquez J, McGenity TJ, Papaspyrou S, García-Robledo E, Corzo A & Underwood GJC (2017) Different types of diatom-derived extracellular polymeric substances drive changes in heterotrophic bacterial communities from intertidal sediments. *Frontiers in Microbiology* 8, 245.

### **Key Information**

- This project has been shortlisted for funding by the ARIES NERC Doctoral Training Partnership ([www.aries-dtp.ac.uk](http://www.aries-dtp.ac.uk)).
- Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship - in 2018/19 the stipend is £14,777.
- Undertaking a PhD with ARIES will involve attendance at training events.
- ARIES is committed to equality & diversity, and inclusion of students of any and all backgrounds. All ARIES Universities have Athena Swan Bronze status as a minimum.
- Applicants from quantitative disciplines who may have limited environmental science experience may be considered for an additional 3-month stipend to take appropriate advanced-level courses.
- Usually only UK and EU nationals who have been resident in the UK for 3 years are eligible for a stipend. The closing date for applications is 23:59 on 8<sup>th</sup> January 2019. Shortlisted applicants will be interviewed on 26<sup>th</sup>/27<sup>th</sup> February 2019

### **How to Apply**

Please apply by sending a CV (including contact details of two academic referees) and a cover letter explaining your motivation and suitability for the PhD to Emma Revill [ariesapp@essex.ac.uk](mailto:ariesapp@essex.ac.uk) by 8<sup>th</sup> Jan 2019. If you have any questions please feel free to contact any member of the supervisory team.

