**Mining for Novel Cu Proteins in Ammonia Oxidising Archaea: A Missing Link in the Nitrogen Cycle? – to start October 2019**

**Christine Desty Scholarship, fully-funded (Home/EU fees £4630 plus stipend of £15,009) for an MSc by Dissertation (MSD) in the School of Biological Sciences, University of Essex**

**Background**. Ammonia oxidising bacteria (AOB) and archaea (AOA) play a critical part in the global nitrogen cycle, with consequences for climate change. Biochemical pathways in AOB are understood, involving multiple enzymatic steps catalyzed by haem enzymes. The related pathways in AOA are almost entirely unknown [1] and genes corresponding to the haem c proteins that perform the downstream chemistry in AOB are absent. A clue to an alternate pathway lies within archaeal genomes, whereby an unusually large number of copper proteins are present. The genome of the first cultivated marine archaeon, *Nitrosopumilus maritimus* (Nmar) codes for six multicopper oxidases (MCOs) that in many cases have no close bacterial homologue [2].

Project Aims: (i) To establish the broader presence of cuproprotein genes in AOA genomes and existing environmental isolates/samples (e.g. soils, aquatic); (ii) to characterize the structure and biochemistry of selected proteins and their roles in alternative Cu-based AO pathways.

This multi-disciplinary project encompasses biochemistry, environmental microbiology, molecular biology, modelling and bioinformatics. The experimental design will give you a rewarding research project with freedom to test hypotheses and develop your own ideas.

You will join the Protein Structure & Mechanisms of Disease and Environmental Microbiology Groups comprising PDRAs, PhD & MSD students and technicians, providing strong support and training for all aspects of the project. This studentship offers excellent employability prospects, given the wide range of transferable skills learned.

**References**

[1] Vajrala, N., et al., Hydroxylamine as an intermediate in ammonia oxidation by globally abundant marine archaea. PNAS, 2013, 110 1006-11.

[2] Walker, C.B., et al., Nitrosopumilus maritimus genome reveals unique mechanisms for nitrification and autotrophy in globally distributed marine crenarchaea. PNAS 2010, 107 8818-23.

**Entry requirements and application procedures**

Highly motivated applicants with, or expecting, a good degree in the broad area of Life Sciences are encouraged to apply.

Applications should be submitted electronically by **24th April 2019** see here for details https://www.essex.ac.uk/pgapply/enter.aspx

You are encouraged to contact the supervisor/s before application: mahough@essex.ac.uk, cwhitby@essex.ac.uk, jowrall@essex.ac.uk and rstrange@essex.ac.uk If you have any queries with the online application process, please contact ecrix@essex.ac.uk

For general information about the School of Biological Sciences at the University please visit our webpages http://www.essex.ac.uk/bs/.

**The University of Essex**

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