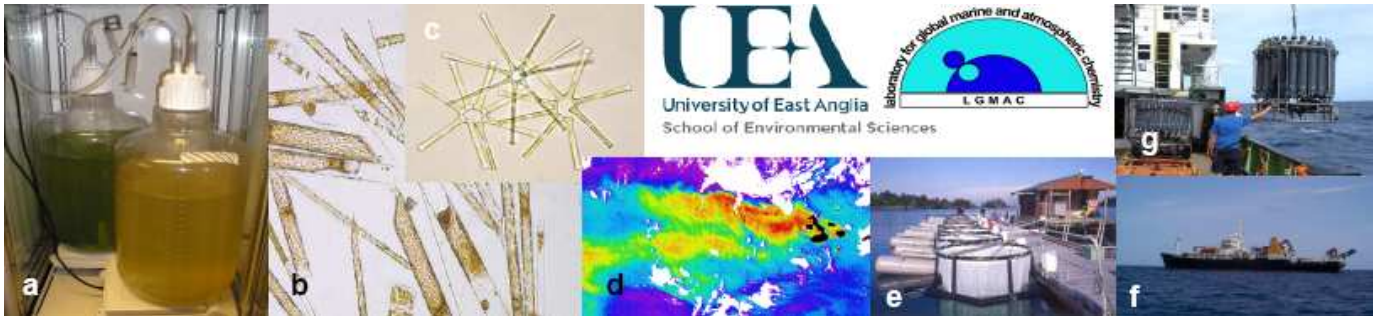
PhD OPPORTUNITY

PROJECT TITLE:

Do marine diatoms play an important global role in the production of DMS and its precursor DMSP?



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THE PROJECT:

The flux of dimethyl sulphide [$(CH_3)_2S$; DMS] from the sea to the air is an important pathway for the global biogeochemical sulphur cycle and the atmospheric oxidation products of DMS may play a role in cooling the Earth's climate. The algal metabolite dimethylsulfoniopropionate [$[(CH_3)_2S+CH_2CH_2COO^-$; DMSP] has properties in common with well-known compatible solutes and is considered the major precursor for DMS.

In the late 1980's Keller and co-workers published data for intracellular DMSP concentration for a wide range of clonal cultures of marine phytoplankton (see Stefels et al 2007). These studies had a strong influence on subsequent DMS research because, together with the field data available at that time, they pointed the way to studies on species that have high intracellular DMSP concentrations in nutrient replete conditions e.g. prymnesiophytes including *Emiliania huxleyi* and various species of *Phaeocystis.* Whilst the general 'rule of thumb' that evolved was that diatoms produce little DMSP, exceptions have been observed and there are examples of high-DMSP level diatom strains from estuarine, benthic and ice algal communities. In addition, Sunda et al. (2002) brought forward the hypothesis that DMSP is the base of an anti-oxidant cascade that enables cells to detoxify harmful reactive oxygen species. The main evidence was from experiments on cultures of the diatom *Thalassiosira pseudonana* and they found that conditions that lead to oxidative stress such as enhanced UV radiation, CO_2 and Fe limitation, Fe limitation, high copper levels and H_2O_2 substantially increased cellular DMSP. Our group's research on this species also suggests that diatoms can be a much more significant source of DMSP when grown under nutrient limitation or stress conditions. Overall the evidence suggests that re-examining the role of diatoms in the DMS cycle would be very worthwhile especially given that diatoms are a major component of many marine phytoplankton communities and account for 40% of total ocean primary production (Sarthou et al 2005). This would be the focus of the PhD project.

The student will join the Marine Trace Gas Biology Laboratory which is part of the Laboratory for Global Marine and Atmospheric Chemistry' (LGMAC). Experimentation on phytoplankton cultures will be central to the project. The student will have access to a wide range of equipment e.g. cell counting and characterisation equipment, controlled light and temperature incubators, fluorescence microscopy, gas chromatography and liquid chromatography instrumentation. Depending upon how the research proceeds it may also be possible to extend the project to field-based research.

FUNDING: In the School of Environmental Sciences we fund PhD studentships from a variety of sources usually via a competitive application procedure. At the time of writing this (June 2011) the most likely start date would be be 1st October 2012. However, if you are interested then **please put in an application as early as possible.**

CANDIDATE PROFILE: The project would suit a self-motivated and resourceful student, with a good experimental skills and practical ingenuity. The ideal candidate for this PhD would have some relevant analytical skills and/or experience of working with phytoplankton cultures. Applicants will need a 1st class or 2i BSc degree in the Biological, Chemical or Environmental Sciences, or Oceanography and/or an MSc in this subject range.

APPLICATION PROCEDURE: Information on the **Postgraduate Research Admissions** procedure can be found via http://www.uea.ac.uk/futurestudents/uk/postgraduates/admissions/pgradmissions. There is an on-line application form but please be sure to read the Application Guidance Notes before making your application.

You will need to upload your CV, scans of your degree transcripts (i.e. showing courses you have done and marks awarded), degree certificates, English language certificates if English is not your 1st language (e.g. IELTS, TOEFL etc) and a statement of not less than 500 words describing why you want to do a PhD, your reasons for choosing this topic and your career goals.

You will also need to ask 2 referees to complete and submit a Referee form for you (this can be accessed via the same page). People you have worked for or done a research project with are the best option here.

Please contact g.malin@uea.ac.uk 01603 592531 if you would like to discuss the detail of the project or the application procedure.

REFERENCES

- Stefels, J., Steinke, M. Turner, S., Malin, G. & Belviso. S. 2007. Environmental constraints on the production of the climatically active gas dimethylsulphide (DMS) and implications for ecosystem modelling. Biogeochemistry 83(1-3): 245-275.
- Sarthou, G., Timmermans, K.R., Blain, S. & Treguer, P. (2005) Growth physiology and fate of diatoms in the ocean: a review. Journal of Sea Research 53: 25– 42.
- Raven, J. A. and A. M. Waite (2004). The evolution of silicification in diatoms: inescapable sinking and sinking as escape? New Phytologist 162: 45-61.
- Sunda, W., Kieber, D.J., Kiene, R.P. &. Huntsman, S. (2002) An antioxidant function for DMSP and DMS in marine algae. Nature 418: 317–320.
- Simo R (2001) Production of atmospheric sulfur by oceanic plankton: biogeochemical, ecological and evolutionary links. Trends in Ecology & Evolution 16: 287-294

FIGURES: a) 20 L phytoplankton cultures, front diatom, back prasinophyte; b) plankton concentrate dominated by *Rhizosolenia* diatoms; c) *Asterionella;* d) diatom dominated plume of water due to upwelling http://disc.gsfc.nasa.gov/oceancolor/scifocus/classic_scenes/03_classics_galapagos.shtml; e) mesocosm facility University of Bergen; f) RRV Discovery; g) collecting water samples at sea.

June 2011