From Catchment to Tap: Source and fate of polar organic chemicals and their associated risks

University of Portsmouth, UK and Southern Water Services Limited, UK

PhD INDUSTRIAL STUDENTSHIP 2016 - EARTH AND ENVIRONMENTAL SCIENCES
This is a fully funded industrial PhD studentship for 3.5 years. The closing date for applications is: 5 pm Sunday, 3rd July 2016. Interviews for short-listed candidates will take place on Tuesday 19th July 2016. Successful applicants will be awarded a University Bursary Stipend of £14,296 p.a. (for 2016/17). The University will pay the full Home/EU fees. Travel costs associated with the industrial placement periods are covered by the project grant.

Supervisory team

- Dr Gary Fones, University of Portsmouth
  http://www.port.ac.uk/school-of-earth-and-environmental-sciences/staff/gary-fones.html
- Professor Graham Mills, University of Portsmouth
  http://www.port.ac.uk/school-of-pharmacy-and-biomedical-sciences/staff/prof-graham-mills.html
- Dr Mark Kerwick, Southern Water Services Limited
  https://www.southernwater.co.uk/

Project overview

The concentration of organic pollutants in surface waters is subject to a number of environmental regulations (e.g. EU Water Framework and Drinking Water Directives). To fulfil these legislative requirements, regulators, water companies and other agencies collect low volume water samples at defined periods of time (e.g. monthly, quarterly or annually) that are analysed subsequently in the laboratory. These data are used by end-users to inform their river catchment management plans and to target any remedial actions. However, low frequency sampling can often fail to provide a representative picture of water quality particularly when pollutant concentrations are known to fluctuate greatly in response due for example the seasonal application of pesticides, rainfall events or pollution incidents.

One method of overcoming this problem is the use of passive sampling devices. These can be deployed in the aquatic environment for extended periods of time (1-4 weeks) and continuously sequester the chemicals of concern. Passive sampling devices have been developed for a wide range of pollutants including, metals, organo-metals, non-polar and polar organics and radionuclides.

The project will use the Chemcatcher® passive sampler, developed at the University of Portsmouth and now used worldwide for monitoring chemicals in the aquatic environment. The device will be used to investigate the source and fate of polar organic chemicals within a river catchment. The field site selected will be within the operational area of Southern Water Ltd. where the surface water is used for the capitation of drinking water. It is proposed that the monitoring will take place over 12 months so that seasonal inputs of chemicals into the catchment and entering the treatment plant can be ascertained.

In the initial phase of the work a wide range of polar organic substances covering different chemical classes such as herbicides, insecticides, fungicides, pharmaceuticals and metabolites and personal care products will be investigated. Previous work indicates that the Chemcatcher® can sequester all these chemicals. Here we will use a screening approach based on a liquid chromatographic-mass spectrometric (LC-MS/MS) method so as to prioritise substances of concern

within the selected catchment. From this, potential sources of these chemicals will be identified together with any associated risks with respect to drinking water quality.
The second phase of the project will investigate the fate of the key substances identified above within a drinking water treatment plant. This will enable better understanding of how effectively polar contaminants are removed across the various treatment process.
The final phase will be to analyse all the findings with respect to the substances found in then catchment and those in the works. These data will form the basis for the identification of risks with the supply of drinking water against the prevailing water quality regulations. The transferability of the findings together with the likely risks to other river catchments within the operational area of Southern Water Services Ltd. will be considered.

Training and other skills
The collaborative research project involves teams from academia and industry. Over the course of the project the candidate will undertake three fully embedded block placements (eight months in total over the lifetime of the project) at the Southern Water Services Ltd. offices in Worthing, West Sussex. This will encompass work-based training in key aspects of the water supply business underpinning the project to include time spent with the water quality, process science and water strategy teams.
In addition, the student will gain experience in analytical chemistry and water monitoring techniques, fieldwork, data analysis and modelling. The project suits a graduate in chemistry or environmental science.
During the course of the project there will be elements of laboratory and field-based research. You will have access to the Graduate School Development Programme and Departmental Postgraduate Researcher Training. You will join the Ecotoxicology and Environmental Monitoring Group comprising of ten academic staff and a vibrant community of researchers. The skills gained during this industrially-based project will give you excellent career prospects for subsequent work in the environmental sector.

Eligibility
The candidate must be a team player and willing to spend time at the Southern Water Services Ltd. offices. The studentship is offered on a full-time basis for Home or EU candidates only. A good honours degree or equivalent in a relevant subject (Chemistry, Environmental Chemistry, Environmental Science or equivalent) is essential. A Master's degree in an appropriate chemical science discipline with recent experience of modern instrumental analytical chemistry and fieldwork techniques is desirable. Exceptionally, equivalent professional experience and/or qualifications will be considered. For those students without English as a first language or without a first degree from an English speaking University, an English Language Proficiency at a minimum of IELTS band 6.5 with no component score below 6.0 is required. It is desirable to hold a UK driving licence.

References and further reading

1. Ecotoxicology and Environmental Monitoring Group: http://www.port.ac.uk/school-of-earth-and-environmental-sciences/research/ecotoxicology-and-environmental-monitoring/
2. University of Portsmouth Graduate School: http://www.port.ac.uk/graduate-school/
3. Chemcatcher: http://www.port.ac.uk/chemcatcher
4. Charriau *et al*., 2016. Talanta 148, 556–571.
5. Lissalde *et al*., 2016. Talanta 148, 572–582.
6. Moschet *et al*., 2015. Water Res 71, 306-317.
7. Gunold *et al*., 2008. Environ Pollut 155, 52-60.
8. Ahrens *et al*., 2015. J Chromatogr A, 1405, 1–11.

Applications and further information
Please apply on line at: http://www.registryhub.port.ac.uk/online_application/ by the deadline of 5 pm Sunday 3rd July, 2016 quoting the project code **SEES2821016**.

Informal enquiries can be made to:

Dr Gary Fones: gary.fones@port.ac.uk

Candidates will be required to submit a two-page project proposal and are encouraged to discuss this with Dr Fones prior to submission.

University of Portsmouth

Southern Water