**Biochemistry of anaerobic ammonium oxidation**

**PhD position at Microbiology, IWWR**

Water has been identified as the major environmental issue of the 21st century. Many parts of the world will experience increasing fresh water shortage, while other parts will have a higher risk of flooding. Poor water quality is a threat for human society as well as for natural ecosystems. The research focus of the Institute for Water and Wetland Research (IWWR) is the natural environment, in particular aquatic ecosystems and wetlands. Many of these environments have been substantially altered by human impact. The changes have resulted in stress responses of all biota and impose major challenges to individuals, populations and the ecosystem as a whole. The IWWR studies the mechanisms of adaptation of microorganisms, plants and animals to these changes at the level of the molecule, the cell, the organism and the ecosystem. The tight coupling of fundamental scientific research to application, distinguishes the IWWR from other national and international institutes on water research. The novel applications for current water problems are developed from innovative fundamental insights in molecular, physiological and ecological processes.

Fifteen years ago the microorganisms responsible for the anaerobic ammonium oxidation (anammox) were discovered in a wastewater pilot plant. This was followed by the development of dedicated cultivation and molecular approaches that resulted in the identification of the responsible anammox bacteria in our laboratory. Recently, the ubiquitous environmental occurrence of the anammox bacteria was demonstrated leading to the realization that anammox bacteria play a major role in nitrogen cycling in nature. Furthermore, the anammox process is an innovative, cost-effective and environment-friendly technology to remove nitrogen from wastewater, and already many full-scale wastewater treatment plants are in operation. The anammox bacteria are unique microorganisms with many unusual properties that we hardly understand. These include the biological turnover of hydrazine, a well-known rocket fuel, the biological synthesis of ladderane lipids, and the presence of a prokaryotic organelle in the cytoplasm of anammox bacteria.

Anammox bacteria have many different multiheme proteins including hydrazine synthase and hydrazine dehydrogenase, two enzymes that catalyze key reactions of anammox metabolism (Kartal et al *Nature* 2011). Protocols for the purification of these proteins have been established and several crystal structures are available. The aim of this PhD project is to elucidate the function and catalytic mechanism of these multiheme proteins. This goal will be pursued by the combination of kinetic studies of the enzymes and the application of a range of spectroscopic and electrochemical techniques. These include UV-Vis, EPR, (Raman-)IR, GC-MS, protein MS (Malditof, FT-MS) and protein-film electrochemistry. The PhD student will take advantage of the state-of-the-art, in-house equipment and active collaboration with international experts in the field (www.ru.nl/microbiology).

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The Department of Microbiology of the Radboud University is located in the Huygens Building with an 800 m² laboratory equipped with state-of-the-art bioreactors, electron microscopy, next generation sequencing and proteomics facilities. Microbiology is one of the priority areas of the Institute of Water and Wetland Research (IWWR) and the university. Currently, the research group of Prof. Jetten has 12 PhD students and 8 post-docs. The **ERC advanced grant** and **Spinoza award** for Prof. Jetten enable the continuation of anammox research with the aim to obtain a fundamental understanding of the biochemistry of the anammox bacteria.

**Expected qualifications of the Anammox Biochemistry PhD Student**

- M.Sc. degree in biochemistry or structural biology;
- Enthusiasm, perseverance, ingenuity, patience and courage;
- Excellent communication skills, team spirit;
- Excellent computer and software skills;
- Fluency in English.

The salary will be between EURO 2.042 and 2.612 gross per month on a full-time basis, depending on qualifications and experience. PhD positions a 1.5 + 2.5 year contract is available after yearly evaluation. Benefits are according to central Radboud University Nijmegen package.

Applications should include a cover letter with motivation and a curriculum vitae with experimental expertise, and 2 outstanding reference letters.

You can apply for the job (mention the vacancy number 62.95.12) before 15 February 2013 by sending your application by email to:
pz@science.ru.nl, Mrs. M. van Oostveen, P&O, FNWI, Radboud University

More information:
For more information on the vacancy you can contact:
**Prof. dr. Mike Jetten** Tel: +31 24 3652941, e-mail: m.jetten@science.ru.nl
**Dr. Boran Kartal** Tel +31 24 3652557, email b.kartal@science.ru.nl
www.ru.nl/microbiology