

Announcement: 2 PhD-positions in systems biology of denitrification

Two 3-year PhD positions are available at **UMB Nitrogen Group**, Norwegian University of Life Sciences (UMB), preferably starting September 2009.

The two positions will be integrated in ongoing research on regulatory biology of denitrification in prokaryotes, which is heading towards systems biology in collaboration with Centre for Integrative Genetics (CIGENE) and several European research groups. A long-term goal is a better understanding of the biological and ecological control of the emissions of N₂O, which is an important greenhouse gas. The research of the two students will be closely coordinated to ensure an enhancement of experimental approaches by computational biology approaches and vice versa.

Position 1: Experimental. Financed by Department of Chemistry, Biotechnology and Food Science (IKBM) and will concentrate on experimental work

Position 2: Modelling. The other position is financed by Department of Plant and Environmental Sciences (IPM), and will concentrate on computational biological approaches in collaboration with CIGENE.

Further information,

for Position 1: contact Professor Åsa Frostegård, asa.frostegard@umb.no

for Position 2: contact Professor Lars R Bakken, lars.bakken@umb.no

More information about the research groups:

UMB Nitrogen Group: <http://www.umb.no/nitrogengroup/>

CIGENE : <http://www.cigene.no/>

Qualifications

The successful applicant must hold a Master degree in a relevant subject.

For position 1 (experimental) this could be biochemistry, molecular biology or general microbiology/cell biology. Candidates with strong and relevant experimental experience will be preferred.

For position 2 (modeling), We want a person with mathematical background and experience in programming, preferably with some experience with computational biology. Candidates with primary training in experimental biology will also be considered.

Terms of employment

The employment will be for 3 years, starting salary is at state salary level 45, which currently is NOK 341 800 NOK per year.

Application

Deadline for applications are 1st of July 2009.

Applications should be sent electronically (+ regular mail with documentations, if necessary).

Links to the server for electronic applications are:

Position 1 (experimental): <https://secure.jobbnorge.no/visstilling2.aspx?stillid=58925>

Position 2 (modelling): <https://secure.jobbnorge.no/visstilling2.aspx?stillid=58964>

The application should include: CV with documentation of education obtained, publications (if any), and up to three letters of recommendation and contact information on references. If it is difficult to judge the applicant's contribution for publications with multiple authors, a short description of the applicant's contribution must be included.

The research project

When faced with a shortage of oxygen many bacterial species, typified by *Paracoccus denitrificans*, are able to switch from oxygen respiration to using nitrates to support respiration in a process known as denitrification. During this process the water-soluble nitrates are converted to gaseous products, including NO and N₂O which are emitted into the atmosphere. Denitrification is the major source of N₂O currently accumulating in the atmosphere at a rate of 0.25% per year. Despite decades of research on N₂O emissions, no plausible mitigation options have been provided apart from reducing the nitrogen inputs through fertilizers and nitrogen fixation. This will not work since sustained N inputs are needed to feed the increasing world population. A better target would be to improve the product stoichiometry of denitrification (N₂O/N₂) in agroecosystems. We acknowledge that this is not trivial, but we are convinced that the chances of finding such management options (if they exist) will be greatly enhanced by systems-based investigations of the regulatory architecture of denitrification. Which is what the current project is about:

The project will be based on and integrated with the ongoing process- and molecular biological studies of the regulatory biology of denitrifying bacteria, including both “paradigm strains” and cells extracted/isolated from environments. The experimental approach will be to study the phenomena evoked by transitions between oxic and anoxic conditions; transcription of the functional genes, quantification of the reductases involved, and flows to the various electron acceptors (O_2 , NO_x). The modeling will be used to analyze such datasets, to explore the possible architecture underlying the observed responses. The modeling will also raise new questions to be addressed experimentally.

The research groups:

The core competence and research activity of the UMB Nitrogen Group is regulatory biology and ecology of denitrifying bacteria. The group has developed a unique system for analyzing denitrification phenotypes by robotized incubation for monitoring oxygen depletion and gas production (NO , N_2O and N_2) in combination with quantification of gene transcription (regulators and reductases in denitrification). We have recently unraveled crucial aspects of the regulation and assembly of N_2O -reductase enzyme in *Paracoccus denitrificans*, with profound implications for the understanding of how its N_2O -emission is affected by oxygen and pH. Current projects include comparative studies of denitrifying bacteria and assemblages (communities). Through a collaborative modeling study, we have discovered novel aspects of NO -regulation in *Agrobacterium tumefaciens*. The group collaborates with several research groups in Europe, US and China, and is currently involved in an initiative to establish a European consortium for systems biology of denitrification.

CIGENE is a Norwegian core facility in genotyping/sequencing/systems biology under the Norwegian Functional Genomics Program (FUGE). The centre is involved in modeling projects including yeast regulatory biology, salmon physiology, and multiscale modeling of the mammalian heart and the mammalian brain. It is recognized for its pioneering roles in combining genetics theory and methodology with systems theory, in combining multivariate analysis with system dynamics and for its early work on design principles in regulatory biology. The centre has substantial experience in running complex theoretical-experimental research programs.