



Euro-FLOW: a European training and research network for environmental FLOW management in river basins. A MARIE SKŁODOWSKA-CURIE ACTIONS Innovative Training Network (ITN) funded under H2020-MSCA-ITN-2017

ESR 5: Microbial metabolism of terrestrial resources in river corridors under variable flow regimes: match-mismatch scenarios between resources and consumers

3 year fixed- term PhD position.

Host institute: Leibniz-Institute of Freshwater Ecology and Inland Fisheries, DE

Supervisors: Dr Gabriel Singer, Jörg Lewandowski (IGB, Berlin, Germany), Chris Robinson (EAWAG, Zürich, Switzerland), José Barquin (University of Cantabria, Spain)

Project Description:

The aim of this PhD project is to understand how water level fluctuations, i.e. natural and anthropogenically-impacted flow regimes, are linked to the metabolism of terrestrially derived dissolved organic matter (DOM) via affecting the match/mismatch between chemical traits of DOM resources and functional capabilities of microbial consumers.

Flow dynamics directly translate to the transport of organic matter along river corridors and thus control its availability as a resource for (primarily microbial) consumers. By different processes, flow dynamics also shape the composition and diversity of microbial consumer communities, e.g. locally by disturbance effects and regionally by mediating dispersal. With the exception of pelagic bacteria, riverine consumers of organic matter are benthic and immobile in comparison to their resources delivered by flow. Metabolism of the chemically highly diverse DOM is a function of match between resource traits and consumer traits. On both sides, functional diversity is likely important for the efficiency at which resources are locally metabolized vs. left over for further downstream transport. The flow regime and alterations thereof thus likely control match/mismatch scenarios between resources and consumers developing along the river corridor, with implications for the organization of food webs and for the metabolism of organic matter, specifically the dissipation of terrestrially derived organic matter to a climatically relevant CO₂ flux outgassing to the atmosphere.

Depending on a research expose to be developed by the candidate the project may be conducted at different study sites with different flow regimes and/or by field- and lab-based experiments as well as modelling approaches. Empirical research could include measurements of DOM decomposition in gradients of resource-consumer match/mismatch at micro- and fieldscale. For this, state-of-the-art optical, chromatographical and mass-spectrometric methods are available to characterize DOM, and molecular-biological tools may be used to characterize microbial communities taxonomically and functionally.

Objectives:

- (1) Investigate the compositional variability of DOM under various flow regimes.
- (2) Identify composition and typical functional capabilities of benthic microbial communities as shaped by intermittent submergence/exposure, hydrodynamic erosion and successional recovery.
- (3) Explore the potential for match/mismatch scenarios to develop between DOM resources and consumers due to flow regime variability and management.

Expected outcomes:

- (1) Knowledge on how flow regime controls compositional variability of DOM resources, composition and key functional properties of microbial consumer communities.
- (2) A first understanding of match/mismatch development between traits of resources and consumers under various flow regimes.
- (3) An upscaling- or model-based assessment of flow variability/management effects on river C cycling on the regional (river corridor/network) scale.

Secondments:

3-month stay at EAWAG in Zürich (Switzerland, host: Chris Robinson) in year 1 or 2 with the purpose of planning experiments and fieldwork.

3-month stay at the University of Cantabria (Spain, host: Jose Barquin) in year 1 or 2 with the purpose of fieldwork.

Eligibility Criteria:

- Applicants must not have resided or carried out their main activity in Germany for more than 12 months in the 3 years immediately prior to their recruitment¹.
- Applicants must hold a first degree and/or Masters degree in environmental science, biogeochemistry, ecology or related disciplines, and be highly motivated to work in an international team including frequent travel between the Euro-FLOW beneficiaries and project partners.
- Applicants must not have more than 4 years (full time equivalent) research experience at the date of their recruitment¹. This is counted from the date they obtain the degree that would let them start work on a doctorate. They must not have been awarded a doctoral degree.
- Experience in publication of results are advantageous.
- Applicants must have excellent written and spoken English skills.

Other requirements:

Candidates should have experience in some of the following fields and be willing to familiarize themselves with the other fields:

- (Bio-)Geochemistry (focus on carbon)
- Microbiology/Molecular biology
- Sampling and measurement techniques in biogeochemistry/ecosystem ecology
- Hydrogeology, hydrology and hydraulics (including measurement techniques)
- Environmental/ecological modeling/Programming/Statistics

¹Date of recruitment is defined as the first day of the applicant's employment i.e. the start date indicated in their employment contract.

EuroFLOW Information:

The regulation of river flows is one of the biggest stressors affecting river ecosystems across the world. In many countries, major legislative efforts are therefore underpinning the development of new approaches to mitigate the impacts of river flow regulation. These approaches are based on optimising the management of river flows to maintain services to humans (e.g. water supply, hydropower) whilst protecting and/or rejuvenating the aquatic environment with water of adequate quantity and quality in space and time (i.e. environmental flows). In this context, a field of applied aquatic science has developed to generate the evidence base for identifying the best ways to manage the quantity, quality and patterns of environmental flows to sustain river ecosystems, Euro-FLOW will train a new cohort of researchers to be future leaders in this field. Within Euro-FLOW, 15 early-stage researchers will develop new theoretical and empirical insights via ground-breaking experimental manipulations, large-scale field surveys and development of cutting-edge models to inform the management of water flows and aquatic ecosystems in river basins. Future research leaders will be developed through advanced training in: (i) river ecosystem science in relation to environmental flows; (ii) transferable scientific and life skills; (iii) collaborative working with international and inter-sectoral networking. Euro-FLOW will produce scientists with the ability to span subject boundaries, e.g. hydrology, geomorphology, geochemistry, ecology, microbiology, modelling and environmental management. The strong involvement of the non-academic sector will provide the PhD students with a holistic perspective on career opportunities.

Host institute information:

The Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) (www.igb-berlin.de) is the largest freshwater research institute in Germany with a mission for the generation, dissemination and application of knowledge about freshwater ecosystems. The IGB program is unique in that it combines basic and

applied research for the benefit of both. Cooperating intensively with the scientific community (universities, research institutes), government agencies, as well as the private sector, guarantees the development of innovative solutions to the most pressing challenges facing freshwater ecosystems and human societies. The IGB is part of the Forschungsverbund Berlin e.V. (FVB). Within the framework of a legal entity the FVB represents eight research institutes operating in the fields of natural, life, and environmental sciences which pursue common interests while maintaining scientific autonomy. IGB is linked through joint professorship to three universities in Berlin. The advertised position will be hosted by the Department of Ecohydrology.

Application details

The application should contain a cover letter that states your motivation, a CV and supporting documents about your education and studies (i.e. transcripts, certificates) and professional experience where applicable and two references. If you are applying for more than one EuroFLOW position, please rank your preferred projects.

In keeping with the IGB's policy regarding gender equality, female applicants are particularly encouraged. Severely disabled applicants with equal qualification and aptitude are given preferential consideration.

Contact Dr. Gabriel Singer gabriel.singer@igb-berlin.de for more information, submit your application via IGB's (www.igb-berlin.de/en/jobs) online job-application facility (button "Apply online").

Closing date: 30 November 2017

Post start date: February 2018