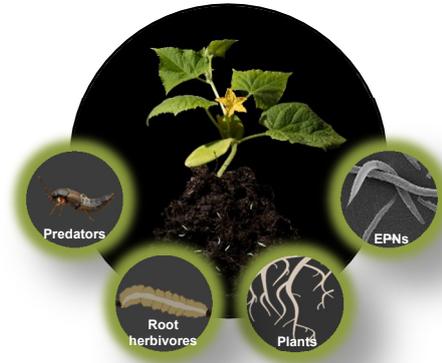


Glowing Belowground: Bioluminescence as a Regulator of Multi-trophic Interactions in the Rhizosphere

Background. Root herbivore insects are often attacked by entomopathogenic nematodes (EPNs) in natural ecosystems. EPNs are tiny roundworms that carry pathogenic bacteria in their intestines. EPNs colonize soil-dwelling insects and release their symbiotic bacterial partners inside. Bacteria reproduce and produce digestive enzymes and toxins that kill the colonized organisms. EPNs then feed on bacteria-digested insect tissues, and reproduce inside the insect cadaver before emerging as infective juveniles to search for a new prey. Fascinatingly, during the infection process, bacteria produce and emit blue light, hence EPN-infected insects become bioluminescent. To understand the adaptive value of this type of bioluminescence, we are unraveling the potential of the light emitted by infected insects to modulate ecological interactions in belowground ecosystems. To reach this objective, using a genetic engineering approach, we have created different bacterial strains that are equally pathogenic to insects but do not produce blue light.



The aim of the PhD project is to use these genetic resources in combination with natural variability to determine the potential benefits that the production and emission of blue light have for the bacteria and their nematode hosts. To reach this aim, the PhD student will evaluate the impact of bioluminescence at multiple trophic levels by evaluating how plants, entomopathogenic nematodes, insect predators and root herbivores respond to the blue light emitted by EPN-infected insects.

We offer a friendly and collaborative research environment, including an international team, direct supervision and all the necessary tools and resources to contribute to the understanding of this unique system. The PhD student will also have the opportunity to learn different techniques and experimental methods in chemical ecology, microbiology, analytical chemistry, plant physiology, molecular biology, behavioral biology, and plant-herbivore-natural enemy interactions.

Excellent candidates should be highly motivated and interested in working with multidisciplinary approaches to understand an ecological system. Strong skills or knowledge in any of the following areas: chemical ecology, microbiology, analytical chemistry, plant physiology, molecular biology, behavioral biology, and/or plant-herbivore-natural enemy interactions are required. Candidates with expertise in other related areas are also encouraged to apply. English skills, both written and oral are required.

This project will take place within the **Experimental Biology Research Group** (Head: Dr. Ricardo A. R. Machado) and it is supported by the Laboratory of Fundamental and Applied Research in Chemical Ecology (Head: Prof. Ted Turlings) and the Laboratory of Microbiology (Head: Prof. Pilar Junier) at the Institute of Biology, University of Neuchâtel, Switzerland.

Applications should be addressed to Dr. Ricardo A. R. Machado (ricardo.machado@ips.unibe.ch), and must include a **single** pdf with your CV, a letter of motivation summarizing your past research experience and future research interest, a list of relevant laboratory skills and techniques, list of publications and relevant certificates (degree certificates, etc.), and the names of two referees (including email address). **Applications will be reviewed until the 29th of February 2020.** The student is expected to start by April 2020, and not later than the end of July 2020.

Note: The project is primarily meant for a PhD student, but bachelor and Master students are also encouraged to apply. In this case, starting dates are flexible. Postdoctoral research applying for funding to join our group will receive all support and are also welcomed to apply.