



Post-doctoral position in chemical ecology of seeds and seedlings, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences

General information

Workplace : Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Yunnan Province, CHINA. The garden's website (<http://english.xtbg.cas.cn>) provides a very complete overview of the facilities and the research and other activities carried out at XTBG.

Name of the responsible scientist : Doyle McKey (CEFE, Montpellier, and visiting professor at XTBG) and Jin Chen (Professor, director of XTBG)

Type of contract : CDD

Contract period : two years, can be prolonged

Start date : Ideally March 2020, can be discussed

Proportion of work : Full time

Remuneration : 15 000 RMB (Yuan) monthly (= 1937 € or \$US 2180), coupled with very low living expenses (see details below)

Eligibility : Applicants should be younger than 35 years old, and should have obtained the PhD degree within the last three years.

Description of the project

How chemical defenses change over plant ontogeny is an active frontier in research on the evolutionary ecology of plant defense. A crucial ontogenetic transition, that from seed to seedling, has been little studied. The objective of this project, funded by the Chinese Academy of Sciences, is to characterize and understand the distribution of chemical defenses against herbivores and pathogens in seeds of tropical plants, and how they change in the transition from seed to seedling. We are designing a study that will take into account several neglected dimensions of variation affecting seed defense strategies : (1) Recognition that a seed is not a 'plant part' but an embryonic plant whose different parts have different defense requirements and different constraints in deploying defenses ; (2) integration of the many different ways to make a seed and the many different ways in which a seed becomes a seedling. We will characterize defenses of seeds with different germination and establishment strategies, reflected by diversity in seed anatomy and seedling functional morphology. (3) inclusion not only of tannins and other polyphenols (which are usually the only defenses studied in multi-species comparisons owing to the relative ease of cross-species comparisons), but also of the great range of *mobile* chemical defenses that, unlike tannins, can be catabolized or translocated to supply resources or defense to the seedling. Mobile defenses are expected to play important roles in

seed defense but have been neglected in multi-species comparative studies. Focusing on two plant families that both produce diverse defense chemicals but that present strong contrasts in their diversity of seed and seedling morphologies (Fabaceae and Lauraceae), we will seek to identify general patterns in the distribution of mobile and of immobile defenses (the latter including physical defenses such as fiber as well as immobile chemical defenses) in different parts of seeds and seedlings. We will also compare the roles of mobile and immobile defenses in seeds, seedlings and mature leaves of the same plant species. Existing seed defense theory integrates some of the functions of seeds (in particular, dispersal, dormancy and establishment), but does not take into account diversity in seed anatomy and germination strategies. This project should thus lead to an important extension of seed defense theory.

We are recruiting a post-doctoral scientist to work with us on this project. The post-doctoral scientist will be part of a team that includes the PI, a PhD student (in ecology) and technical staff in the General Laboratory (phytochemistry) and in the Garden's seed bank and nursery facilities, where seeds will be stored and then germinated and grown under controlled conditions, providing material for analysis at different stages of seedling development. The post-doctoral scientist will be in the research group on Evolutionary Ecology of Plant-Animal Interactions, and will interact with members of other research groups on related topics who are contributing to the project.

Main activities

The postdoctoral researcher, with the help of technicians and the advice of faculty, will be responsible for phytochemical analyses of different tissues of seeds and seedlings of selected species of the two studied families. The diversity of kinds of molecules studied will require innovative approaches that may include metabolomics, molecular networking and computer-assisted identification of molecules. The postdoctoral researcher will use the modern tools developed for the identification of natural products (MS2LDA, MolNetEnhancer or MetWork). The postdoctoral researcher will also work to understand the processes underlying changes in defenses from seed to seedling (e.g., translocation, catabolism of seed defenses to 'primary' metabolites, *de novo* synthesis of defensive metabolites in seedlings, etc.).

Skills and qualifications

We are looking for highly motivated candidates with a PhD in natural products chemistry, phytochemistry, metabolomics or related fields, interested in pursuing an academic career and with a strong interest in the application of chemistry to ecology (e.g., chemical ecology, ecophysiology of plant chemical defenses). Very good expertise in modern methods of analysis of diverse plant metabolites is required (HPLC, LC-MS/MS, GC-MS, NMR and data mining), along with excellent communication skills in English (both written and spoken). Programming skills would be an asset.

Working context

Material conditions : Monthly salary is 15,000 RMB (Yuan), i.e., about \$US 2180 (1937€). This is a competitive and very comfortable salary considering that (i) free health insurance is also provided, (ii) XTBG supplies housing (an apartment of 55-60 m²) free of charge and (iii) cost of living is very low. Including food, electricity, water, internet, telephone, etc., cost of living is estimated at about 1000

Yuan per month. A kindergarten for pre-school age children is conveniently located on the XTBG campus and available at nominal cost.

In addition to the salary, postdocs are encouraged to apply for various fellowships and scholarships, which often have a high rate of success. Obtaining these can lead to substantial increases in monthly income. There are also various incentives associated with publication. Further information about terms and conditions of employment are available on request.

Working environment : Xishuangbanna Tropical Botanical Garden (XTBG), part of the Chinese Academy of Sciences, includes world-class laboratories in chemistry, molecular biology and many fields of ecology and evolution, with state-of-the-art equipment and with faculty and students from over the world (<http://english.xtbg.cas.cn/au/bi/>). Of particular importance to the specific project to which this postdoc is attached are the living collections, seed bank and nursery facilities, and the Central Laboratory (http://english.xtbg.cas.cn/ptsc/au/cl/201607/t20160708_165482.html).

XTBG is located in a wonderful setting in Yunnan province, in tropical southwestern China, near the borders with Myanmar and Laos. Yunnan province is the most ethnically diverse in all of China, with 34 different ethnic groups. Culture, architecture and cuisine are comparably diverse. Climate is mild and tropical (mean annual temperature 21.4 °C). The atmosphere is rural. This 1125-hectare botanical garden, recognized as one of the most beautiful and well-maintained in the world (and harboring over 13,000 plant species), includes a 250-hectare patch of well-preserved primary tropical rainforest. Menglun town (approximately 17,000 inhabitants), a pleasant provincial city, is just across a bridge from the garden. Cost of living is much lower than in China's large cities, and the clean air and open spaces make XTBG a wonderful place to live. The garden is an hour's drive away from Jinghong airport, which offers connections to all of China and the rest of the world.

Application

Applications will follow a two-step process. First, expressions of interest should be sent to Doyle McKey (doyle.mckey@cefe.cnrs.fr) and Jin Chen (chenjin@xtbg.ac.cn) no later than 15 October 2019. We will then assist candidates in preparing the application, which must be submitted to XTBG. The expression of interest must be written in English and contain (i) a statement of academic interests and motivation for applying to this position, (ii) a Curriculum Vitae including a complete publication list, (iii) a brief description of the approach you would plan to use to tackle this research problem and (iv) contact information for two reference persons. The information in the expression of interest will then be incorporated (along with other information) in the application form that you will submit to XTBG. Planned starting date is 1 March 2020.