



URPP

Evolution in Action

PhD position in Plant Evolutionary Biology, University of Zurich.

University of Zurich, Depts. of Systematic and Evolutionary Botany & Plant and Microbial Biology

RESEARCH PROJECT:

The relative contribution of genetic and epigenetic variability to adaptation.

Genetic variation in form of *de novo* mutations or standing genetic variation is the major source of variation in complex traits that can enable adaptation through the process of selection. This is a fundamental tenet of the modern evolutionary synthesis that combines Darwin's ideas with that of Mendelian genetics. Nevertheless, in recent years, the assumption that only the genetic code can contribute to inheritance of biological traits has been challenged with the discovery of trans-generational epigenetic inheritance. Phenotypes induced by environmental factors can be passed on over multiple generations owing to relatively stable, long term changes in gene expression. It is known that some types of epigenetic marks behave like genetic mutations (epimutations), they are variable in natural populations, and are heritable to the next generation with considerable influence on the phenotype. Owing to these reasons, it has been put forward that epigenetic variation may have the ability to influence the heritable variation of complex traits and thus can potentially contribute to adaptation. Nevertheless, the respective role of epigenetic and genetic variation in the process of adaptation is presently not well understood. Furthermore, the relative and quantitative contribution of epigenetic and genetic variability to adaptive processes is not known.

In this project we will use plant model systems (the moss *Physcomitrella patens* and the liverwort *Marchantia polymorpha*) in experimental evolution experiments coupled with high-throughput sequencing to address this fundamental issue in detail. During the experimental evolution experiments, we will record and quantify phenotypic changes and their overall relative contribution to adaptation in epigenetically and genetically diverse populations. We will also carry out whole-genome bisulfite sequencing, gene expression profiling, and DNA re-sequencing experiments on a subset of individuals to investigate the genomic basis of phenotypic change. Finally, we will test the stability of the acquired phenotypic traits.

This research will be carried out in a collaboration between two groups of the URPP “Evolution in Action” by combining their complementary expertise on the model system and experimental evolution.

This project is funded by the University of Zurich’s Research Priority Program (URPP) “Evolution in Action: from Genomes to Ecosystems” to Peter Szovenyi and Ueli Grossniklaus (<https://www.evolution.uzh.ch/en.html>). The URPP Evolution in Action is an umbrella organization bringing together evolutionary research across many departments and topics ranging from linguistics to molecular biology. It consists of professors, PhD students, and postdoctoral fellows with the goal to facilitate interdisciplinary research and create new ideas. The PhD position is fully funded for four years including retreats, courses, and bioinformatics support by the URPP.

The Dept. of Systematic and Evolutionary Botany hosts research groups working on the evolutionary and ecological drivers of biodiversity, on the macroevolution of plants, on plant-insect interactions/pollination, on the evolution of mating systems, hybridization and speciation. The Dept. of Plant and Microbial Biology hosts many groups working on plant molecular and developmental biology, epigenetics, molecular evolution, community genomics, plant defence and plant adaptation. Both institutes are housed in the beautiful Botanical Gardens and host a diverse community of researchers in plant biology.

Ideal candidates will have an MSc in biology with a specialization in evolution, genetics, and/or bioinformatics. This position primarily involves experimental evolutionary research, bioinformatic work, and requires advanced skills in handling, analyzing, and interpreting high-throughput next-generation sequencing data. Nevertheless, in the second phase of the PhD, reverse genetic experiments are planned and thus good skills in making constructs, carrying out genetic transformation, and microscopy are also required. In case not all these skills are covered, the willingness to quickly acquire them is absolutely necessary. Students should be willing to work both in the wet lab and in the office doing computational work. The position is for four years. Selected candidates will enroll in the PhD Program Evolutionary Biology of the Life Science Zurich Graduate School.

CLOSING DATE: The position is opened until filled, but all application material including **CV**, a summary of **research experience**, a **letter of motivation**, **copies of relevant publications** (published or submitted), and **names and contact information of three referees**, sent **as a single PDF file**, should be received by 28th Oct. 2020 to ensure full consideration. The position will start in January 2021. Candidates should indicate in a cover letter when they could take up the position.

Please send all application material with the following subject line “PhD_URPP” to: Peter Szovenyi, peter.szovenyi@uzh.ch, as a single pdf document. For enquiries please contact Peter Szovenyi (peter.szovenyi@uzh.ch).