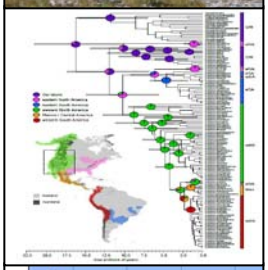
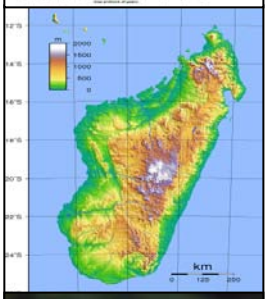
Masters Projects: Plant Systematics & Evolution





Our research investigates the evolutionary dynamics of species diversification. Why do some groups of organisms have more species than others? Why do some evolutionary lineages diversify more rapidly than others? What are the explanations for these imbalances in the Tree of Life? What combinations of intrinsic traits and extrinsic opportunities best predict diversification rates? How does diversification differ between lineages in different biomes? What can this tell us about historical assembly of biomes?

We do field, laboratory and herbarium work to generate geographical, ecological and genome-scale sequence data. We build phylogenies and investigate patterns and processes of diversification across time and space. We work on the legume family, one of the most spectacular examples of evolutionary success in the flowering plants and one of the most economically important groups of plants.

Madagascan Mimosoids. Madagascar is one of the world's hottest biodiversity hotspots. This biota shows a distinct signature of evolution in isolation both in the high levels of endemic diversity and the imbalance of lineages. This project will investigate the historical assembly of the mimosoid legume flora of Madagascar, to investigate the mechanisms by which Madagascar's biota came to reside there.

Mediterranean plant hotspots. The five diversity hotspots in Mediterranean-type vegetation provide unusual opportunities to address questions in biogeography and evolutionary diversification. This project will investigate diversification of the c. 500 species in the legume tribe Genisteae in S. Africa, Chile, California and the Mediterranean. This will involve fieldwork in Morocco, lab work to generate DNA sequence data, and phylogenetic analysis.

Compound leaves in mimosoid legumes. The leaves of mimosoid legumes show spectacular variation in sizes and numbers of parts. This morphological diversity has never been quantified or placed in a comparative phylogenetic framework. This project will document the diversity and evolutionary history of compound leaves across mimosoid legumes in relation to the tempo of diversification in tropical rain forest, dry forest and savanna biomes of the world.

Hybridization and species limits in a hotspot of Andean dry forest diversity. Genome-scale DNA sequence data are providing exciting new opportunities to investigate hybridization and species limits in plants. Using new genome-scale data resources for legumes, this project will investigate interspecific hybridization and species boundaries for a set of globally rare tropical forest *Mimosa* species endemic to the Andean Marañón valley in northern Peru.

Ancient polyploidy. Polyploidy, or whole genome duplication (WGD), is a potential driver of diversification in flowering plants. Determining whether recent polyploids are allo- or autopolyploids is relatively straightforward, but more challenging for ancient WGD events. This project will use plastid genome and nuclear gene sequences to investigate ancient polyploidy in mimosoid legumes.

Indigenous domestication of Mediterranean Lupins. The legume genus *Lupinus* includes multiple food crop species thought to be the result of early indigenous domestication in the Mediterranean and the Andes. This project will investigate where, when, how many times and from what progenitors the Old World food crop species were domesticated. The project will involve field, herbarium and laboratory work on the Mediterranean basin species.

To discuss these or other project ideas contact: Dr. Colin Hughes, Inst. Systematic Botany, UZH. colin.hughes@systbot.uzh.ch