MBGE THESIS PROPOSAL

- 2018/2019 -

TITLE	**Molecular and population genetic signatures of cytonuclear interactions: the *Podarcis* model**

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SHORT ABSTRACT *(overview, objectives and methods)*	OVERVIEW: Proteins encoded by nuclear (nDNA) and mitochondrial DNA (mtDNA) interact in close contact in the oxidative-phosphorylation (OXPHOS) pathway enzyme complexes which mediate cellular respiration. This functional interaction implies that nuclear- and mtDNA-encoded subunits will be under strong selection to experience coordinated evolutionary trajectories. The specific role that these coevolutionary forces have in shaping genetic diversity in natural populations, including in promoting speciation, is still obscure. This project implies a thorough study of the evolutionary dynamics of the OXPHOS genes using Iberian and North African wall lizards (*Podarcis*) as model system. In this cryptic species complex several instances of mtDNA-nDNA discordance have been detected, providing an invaluable opportunity to evaluate whether the evolution of nuclear OXPHOS genes is more likely to correlate with that of the mtDNA than any other nuclear gene. OBJECTIVES: The main objective of this project is to document the molecular and population genetic signatures of mtDNA-nDNA coevolution by testing the following hypotheses: if cytonuclear interactions are important determinants of molecular evolution, we should observe i)coordinated changes in composition between interacting subunits; ii)different patterns of substitution between interacting and non-interacting residues; iii)selective signatures of coadaptation. At the population genetics level, we expect that the nuclear OXPHOS genes, when compared to control genes, will present an overrepresentation of loci exhibiting similarities to the mtDNA in terms of i) phylogenetic patterns; ii) selective signals; iii) cline center and width; iv) overall levels of gene flow; plus v) high levels of cytonuclear disequilibrium in hybrid populations. METHODS: This is a strictly computational project. The student will work with a previously generated NGS data set obtained for the complete set of OXPHOS genes plus >100 random genes for ~300 individuals and will use a variety of state of the art NGS post-processing tools and population genetics methods to test the above-mentioned hypotheses.

PROJECT	*Name*	OXPHOS: Molecular and population genetic signatures of cytonuclear interactions: the *Podarcis* model (EXPL/BIA-EVF/1283/2012.
	Funding (if appropriate)	This project is strictly computational and requires no money for laboratory work.