

Workshop of the ERC project MUSEUM : Multi- Scale Eco-Evolutionary population dynaMics



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Concentration in selection-mutation models: error estimates and asymptotic expansions

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In this presentation we study an integro-differential equation which describes the evolutionary dynamics of a population structured by a phenotypic trait. This population undergoes asexual reproduction, competition, selection, and mutation. We provide an asymptotic analysis of the model, assuming that the mutations have small effects. A standard approach for the analysis of the qualitative properties of the solutions of such an equation is to apply a logarithmic transformation, which yields a Hamilton–Jacobi equation with constraint. When the reproduction term is a concave function of the trait, it has been established that the solution is classical. We rigorously derive a first-order asymptotic expansion of the solution. This expansion allows us to approximate the moments of the phenotypic density. This result establishes a connection between the approximations of the phenotypic density obtained via the Hamilton-Jacobi approach and relevant biological quantities, which are more suitable from a modeling perspective. This is a joint work with my PhD advisors, Sepideh Mirrahimi and Jean-Michel Roquejoffre.

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