Spatial populations with seed-bank

Frank den Hollander, Leiden University, The Netherlands
joint work with Andreas Greven (Erlangen) and Margriet Oomen (Leiden)

In this lecture we consider a spatial population with seed-bank. Individuals carry one of two types, live in colonies labelled by a countable Abelian group playing the role of geographic space, and are subject to resampling and migration as long as they are active. Each colony has a seed-bank into which individuals can retreat to become dormant, suspending their resampling and migration until they become active again. Our goal is to understand in what way the seed-bank enhances genetic diversity.

When individuals become dormant they adopt a random colour that determines their wake-up time. The system of continuum stochastic differential equations describing the population in the large-colony-size limit has a unique strong solution that converges to an equilibrium parametrised by the initial type densities. This equilibrium exhibits a dichotomy between two phases: coexistence (= locally multi-type equilibrium) versus clustering (= locally mono-type equilibrium). We identify the parameter regimes for which these two phases occur. We also establish the finite-systems scheme, i.e., identify how a finite truncation of the system (both in the geographic space and in the seed-bank) behaves as both the time and the truncation level tend to infinity, properly tuned together.