Biomathmatics seminar
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Evolution and the genetic and demographic spatial structuring of populations

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Natural populations display spatial structuring at both an ecological and a genetic level. Although the consequences of genetic structuring for evolution are well appreciated, the crucial evolutionary role of the interplay between spatial demographic structuring and spatial genetic structuring has often been overlooked. For instance, many theoretical studies rely on the simplifying assumption that local populations have constant size, thereby neglecting the feedback between life history traits and population density.

My aim in this talk is twofold. First, I present a theoretical method, based on spatial moment equations, that has been used to investigate the evolution of spatially structured populations. The core of this method is to derive approximate deterministic dynamics for various spatial moments such as the densities of pairs, triples, and so on. I show how this technique can be used to tie together both demographic and genetic structuring in a single ecological framework, and to derive enlightening analytical expressions for the selection gradient.

Second, I show how this technique can be applied to study a variety of evolutionary questions, such as the evolution of life history traits (e.g. reproductive effort), helping behaviours (e.g. altruism and parental care), and host-parasite interactions (e.g. parasite virulence and dispersal). In particular, I discuss the links with classical population genetics and kin selection approaches to the evolution of spatially structured populations.

I conclude by discussing the relevance for theoretical and empirical studies of explicitly taking into account the feedback between spatial structuring, life history and evolution.