

RANDOM MODELS FOR BIOLOGY.

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The goal of these lectures is to present some current random models used for describing biological phenomena like, population dynamics, ecology, evolution, biodiversity ...

Contents:

- I. Galton-Watson models in discrete time.
- II. Jump processes in continuous time.
- III. Branching processes.
- IV. Birth and Death processes.
- V. Large population limits.
- VI. Wright Fischer models.

For all these models we will introduce the probabilistic tools and main first results :Markov property, explosion, long time behaviour, quasi-stationary distributions ... We will discuss the biological relevance of the models. We will also show how, considering various scaling, leads to different limiting deterministic or stochastic new models.

Perequisites: Standard probability notions of the first year of Master (probability, conditionnal expectation, Markov property). Attending the first term A7 course and the C4 reading seminar is recommended. Some notions introduced in the A8 course should be useful (but not necessary)

References:

1. The first chapters of the book "Some stochastic models for structured populations: scaling limits and long time behavior." by S. Méléard and V. Bansaye
2. "Branching processes." by K. Athreya and P. Ney.
3. "Modèles aléatoires en Ecologie et Evolution." by S. Méléard (on the author's web-page)