eco-evolutionary models

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what are eco-evolutionary models?

- Hutchinson: evolutionary theater, ecological play (i.e. ecological rates $\gg$ evolutionary rates)
- what if the rates are similar?
  - ecological dynamics (e.g. logistic equation)
  - evolutionary dynamics (changes in traits)
- alternatively, population genetics plus population dynamics

why aren't all models like this?

- eco/evo time scales are often different
- it's hard!
  - most population genetic models assume constant population size
  - most ecological models assume constant traits

how do we do it?

- range of realism/complexity
- individual or agent-based models
  - each individual has a genotype and a phenotype
  - rules for life history and interactions
- models for the distribution of a continuous trait
  - partial differential equations
  - reaction-diffusion equations
  - includes demography, mutation
- moment equations
  - simplify PDEs to equations for the means and variances of traits, plus population densities
- Price equations:
  - further simplify to equations for the means of traits (assume constant variance)

individual-based models

distribution models

moment equations

Price equations

PDE basics