

Module M2 “Concepts et méthodes en Biologie”

Part 1: Forces that drive evolution

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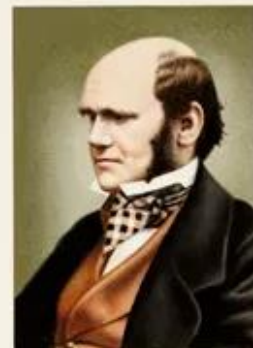


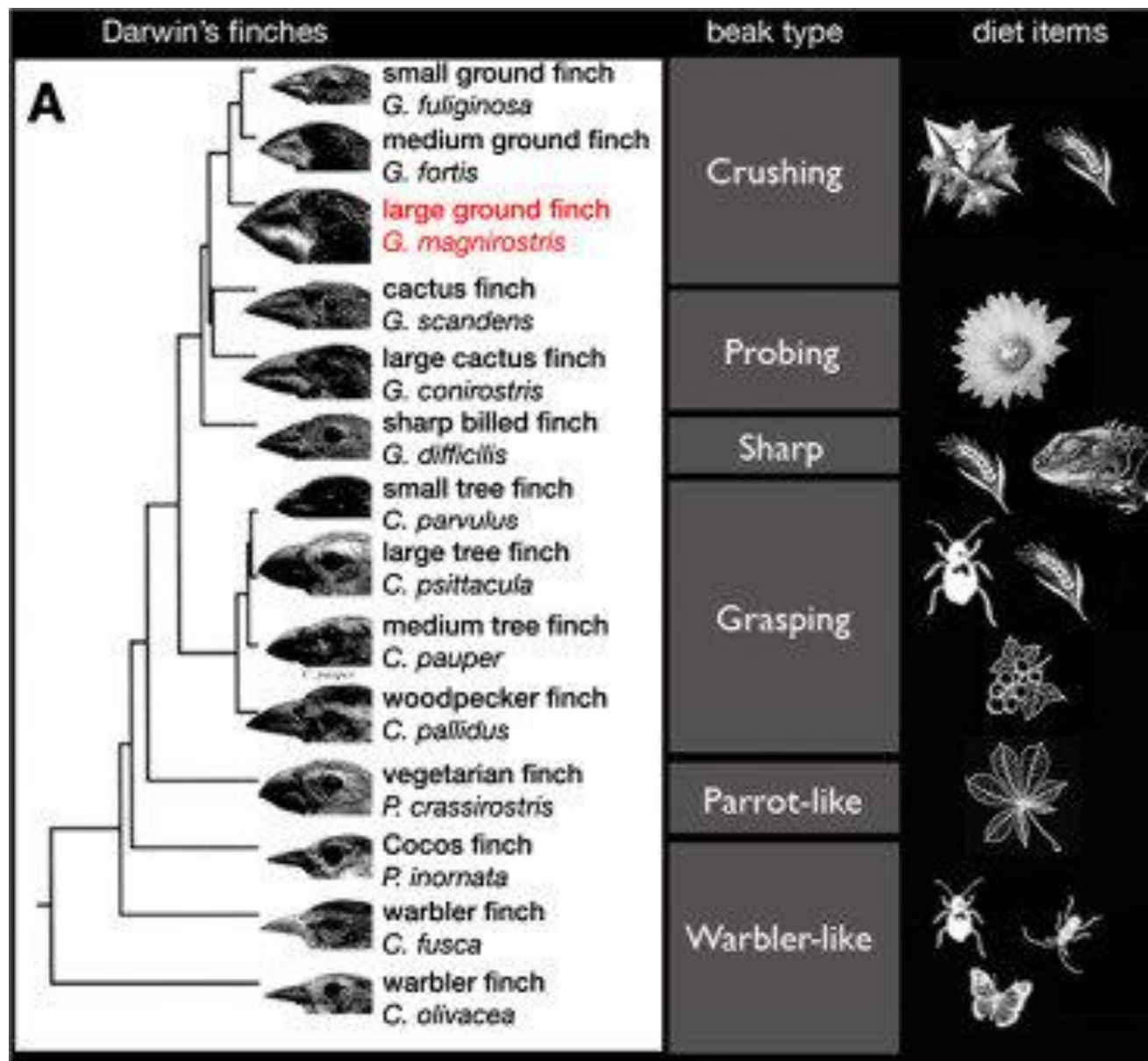






Angraecum sesquipedale (now commonly known as Darwin's orchid) and the Xanthopan morganii moth as photographed by Robert Clark for Evolution





(Modified from Rands et al 2013)

Mouthpart plasticity among cannibals

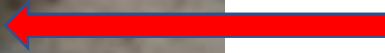


Tadpole of Spadefoot toad
Photo by B. Storz

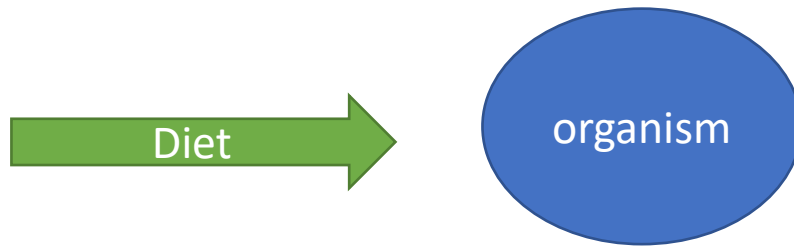
Cannibal morph

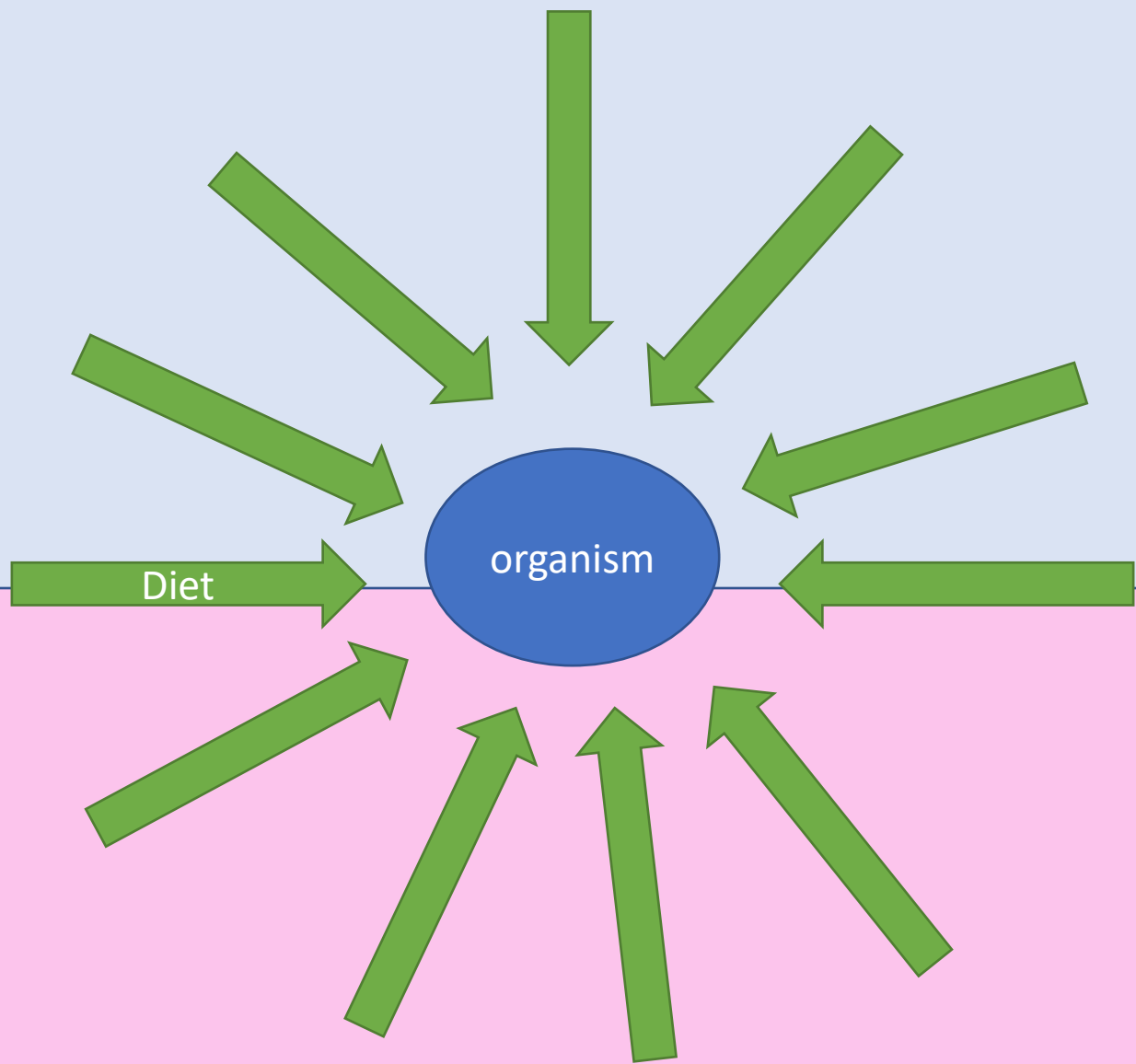


Typical morph



Salamander larvae
Photo by Y. Kohmatsu





Abiotic factors

- Temperature
- Altitude
- Pollution
- Terrain
- Salinity
- Humidity
- Latitude
- Light
- Chemicals
- Oxygen

Atacama desert



Amazon rain forest



Dead sea



Tibetan plateau



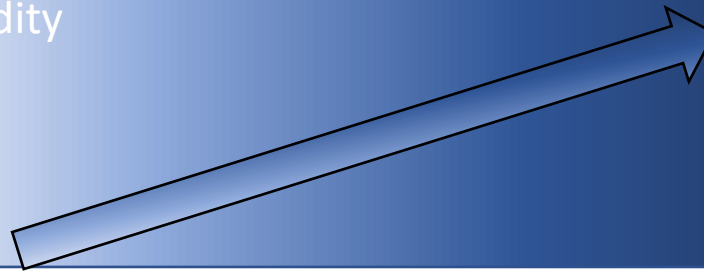
Arctic



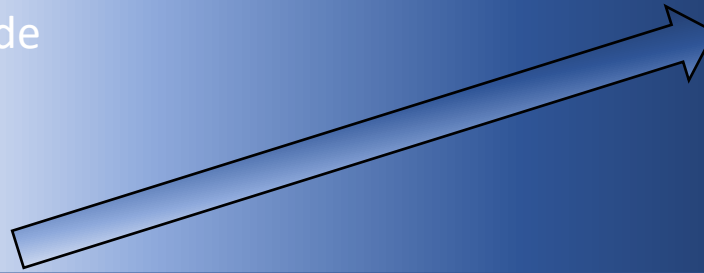
Death valley



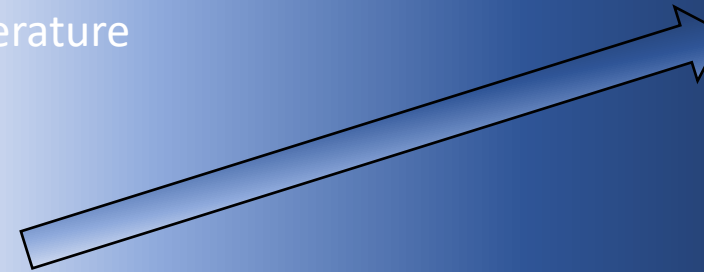
Humidity



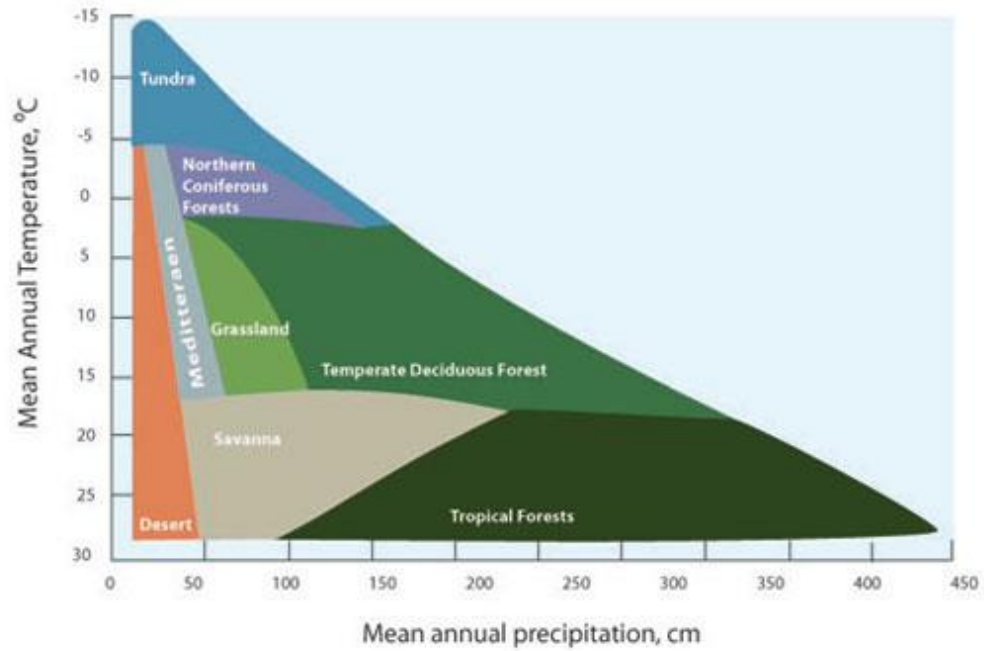
Altitude



Temperature



Adaptative responses to temperature



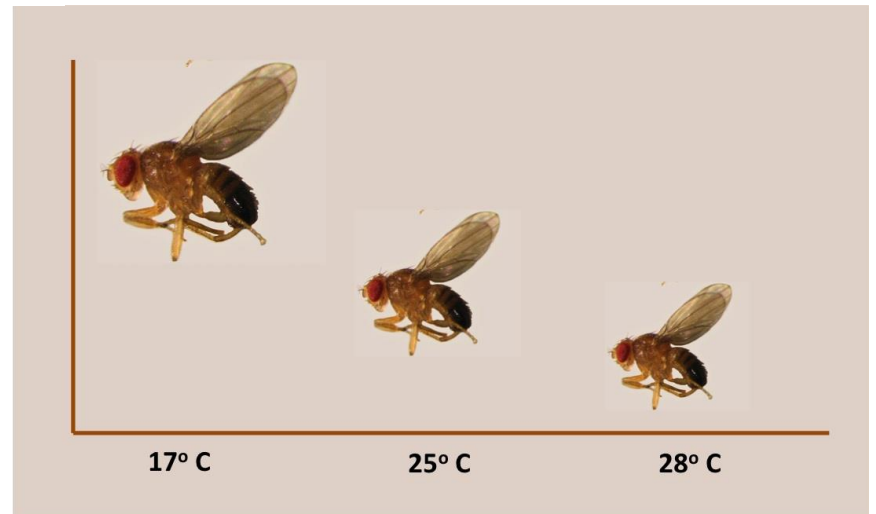
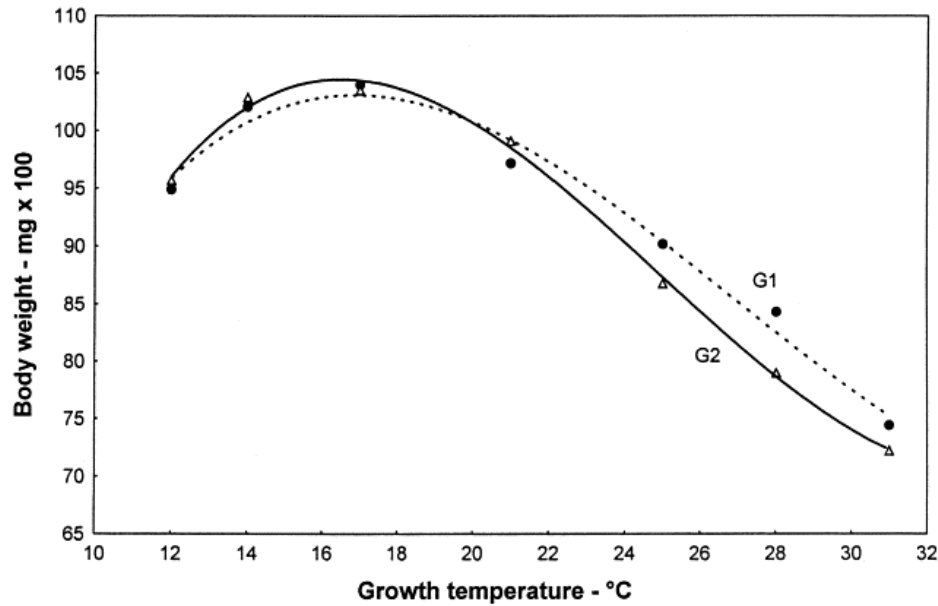
High temperature



Low temperature



Phenotypic or plastic response to temperature







The peppered moth

In Manchester, in the early 1800s, nearly all were light coloured:



By 1895, nearly all were dark:



Interaction between abiotic factors



Biotic factors

- Prey
- Predators
- Pathogens
- Parasites
- Hosts
- Symbionts
- Mates
- Rivals

Coevolution

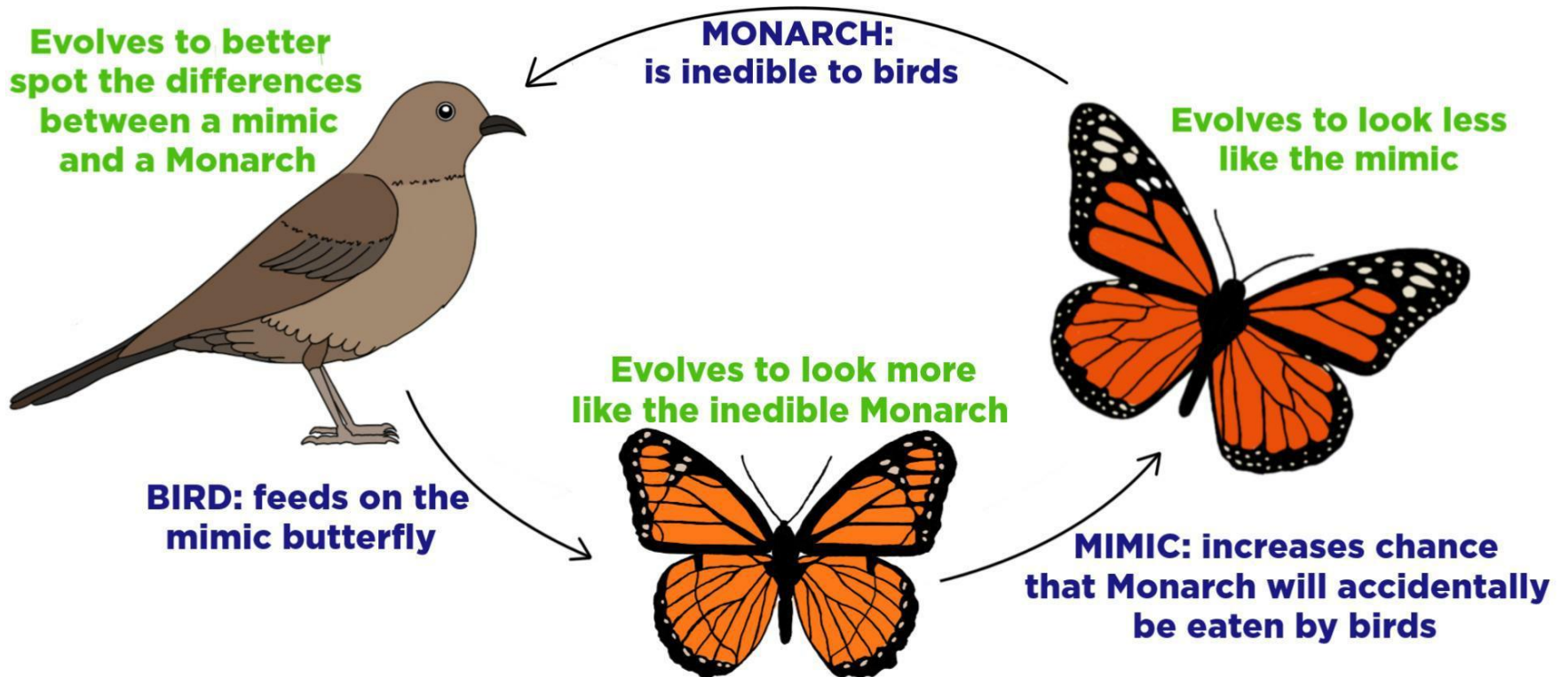
- Prey-predator systems
- Host-pathogen/parasite systems
- Developmental competition
- Male-male competition
- Sexual mate choice

Prey-predator systems

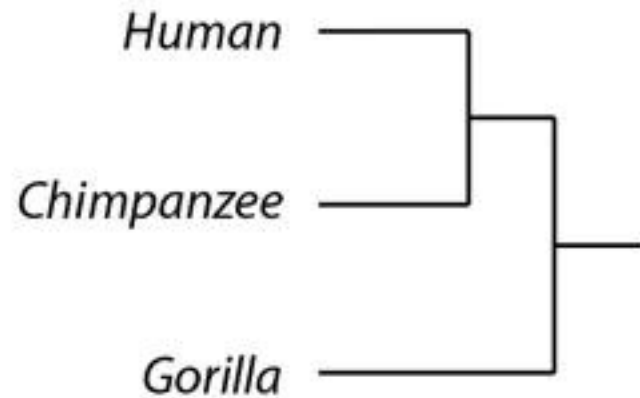
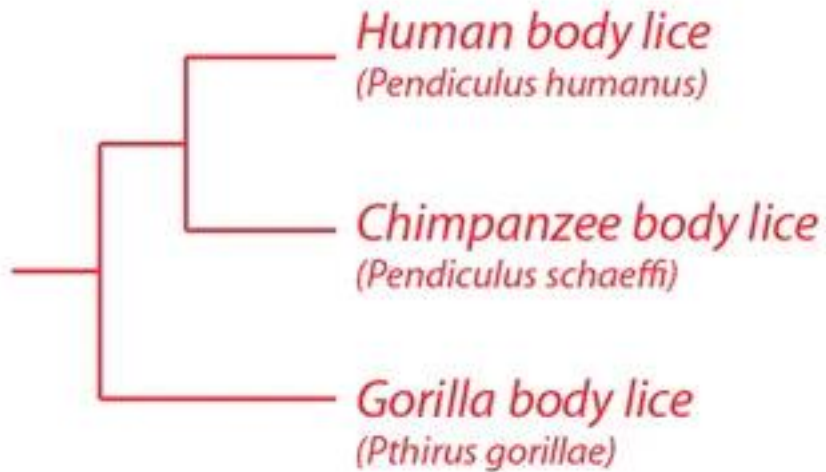


Prey-predator systems

COEVOLUTION EXAMPLE: BUTTERFLIES AND BIRDS



Host-pathogen/parasite systems



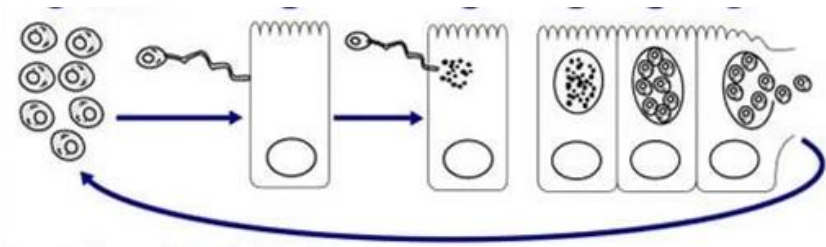
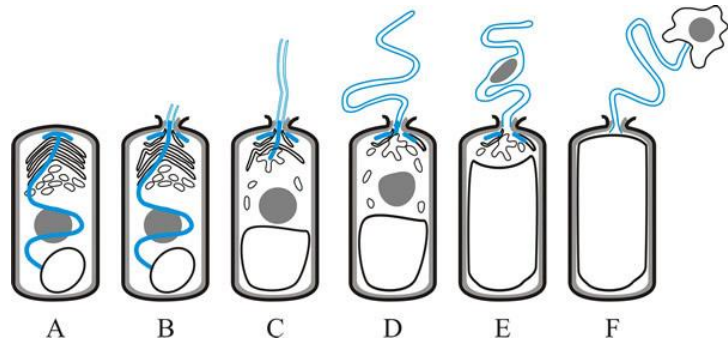
Host-pathogen/parasite systems



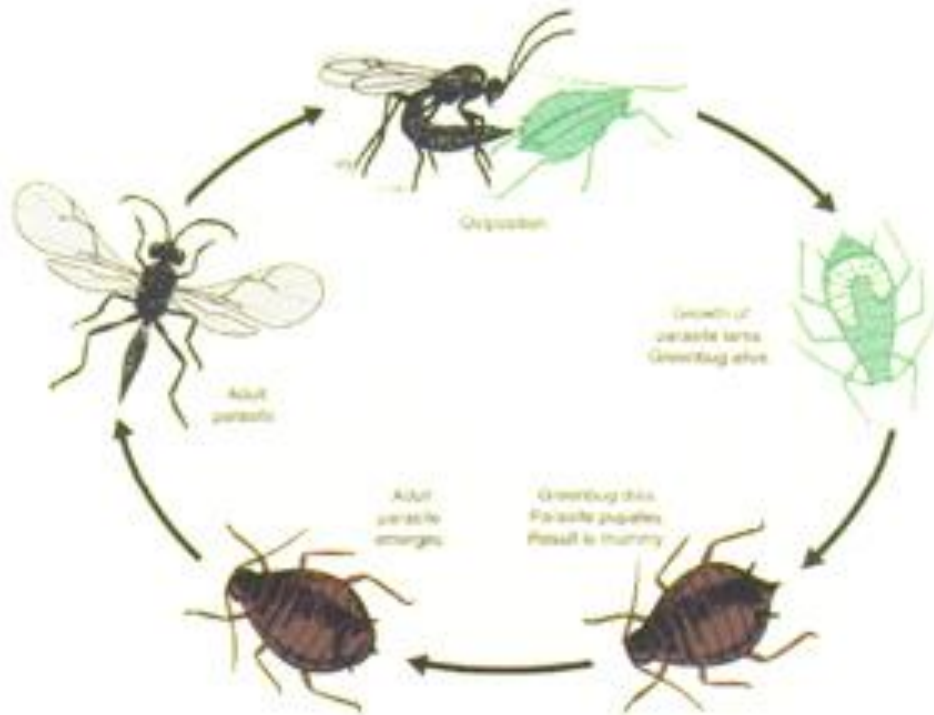
Host-pathogen/parasite systems



Microsporidia



Host-parasitoid systems



Host-parasitoid systems



Developmental competition



Optimal investment: egg size versus egg number

Developmental competition

Parental care



Sibling cannibalism



Filial cannibalism



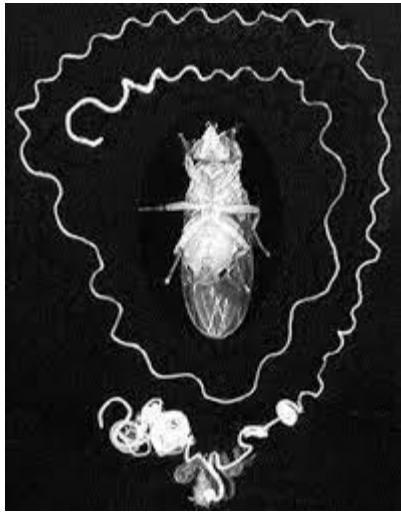
- Trophic eggs
- Faster development
- Niche partitioning
- Defence strategies
- **Kin recognition**

Male-male competition



Male-male competition (*Post copulatory*)

Infanticide



Drosophila bifurca

- Sperm competition
- Sex peptides
- Male mating plugs



Male-male competition

Male coalitions



Sneak mating



Non-lethal male-male combat



Random mating



Sexual mate choice









1. Are males more choosy or females?

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2. Why do you think females are more choosy in most species?

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2. Why do you think females are more choosy in most species?

Bateman's principle

Angus John Bateman (1919–1996), an English geneticist.

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2. Why do you think females are more choosy in most species?

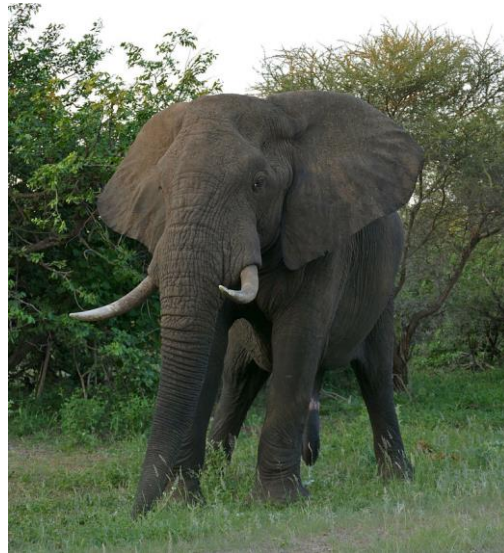
Bateman's principle

Angus John Bateman (1919–1996), an English geneticist.

3. What are the females is looking for?

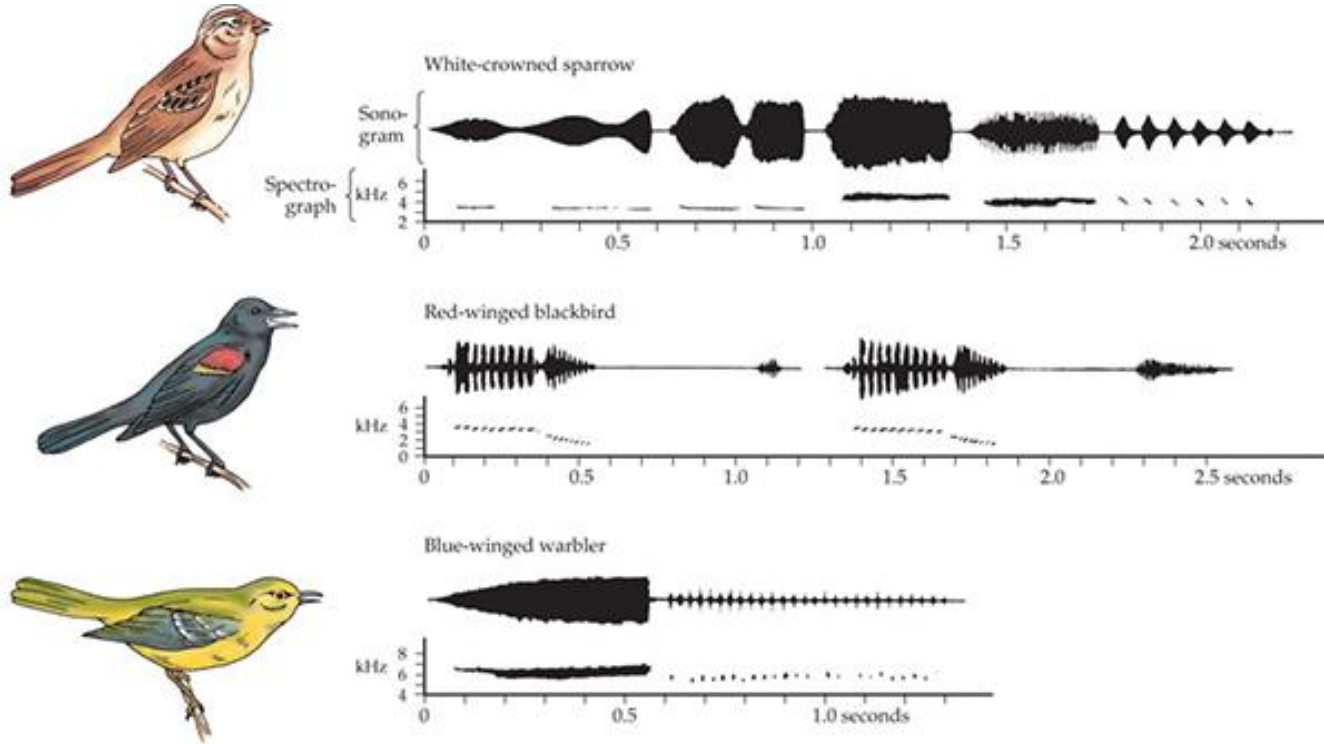






Nonvisual modalities in mate choice

Male song quality

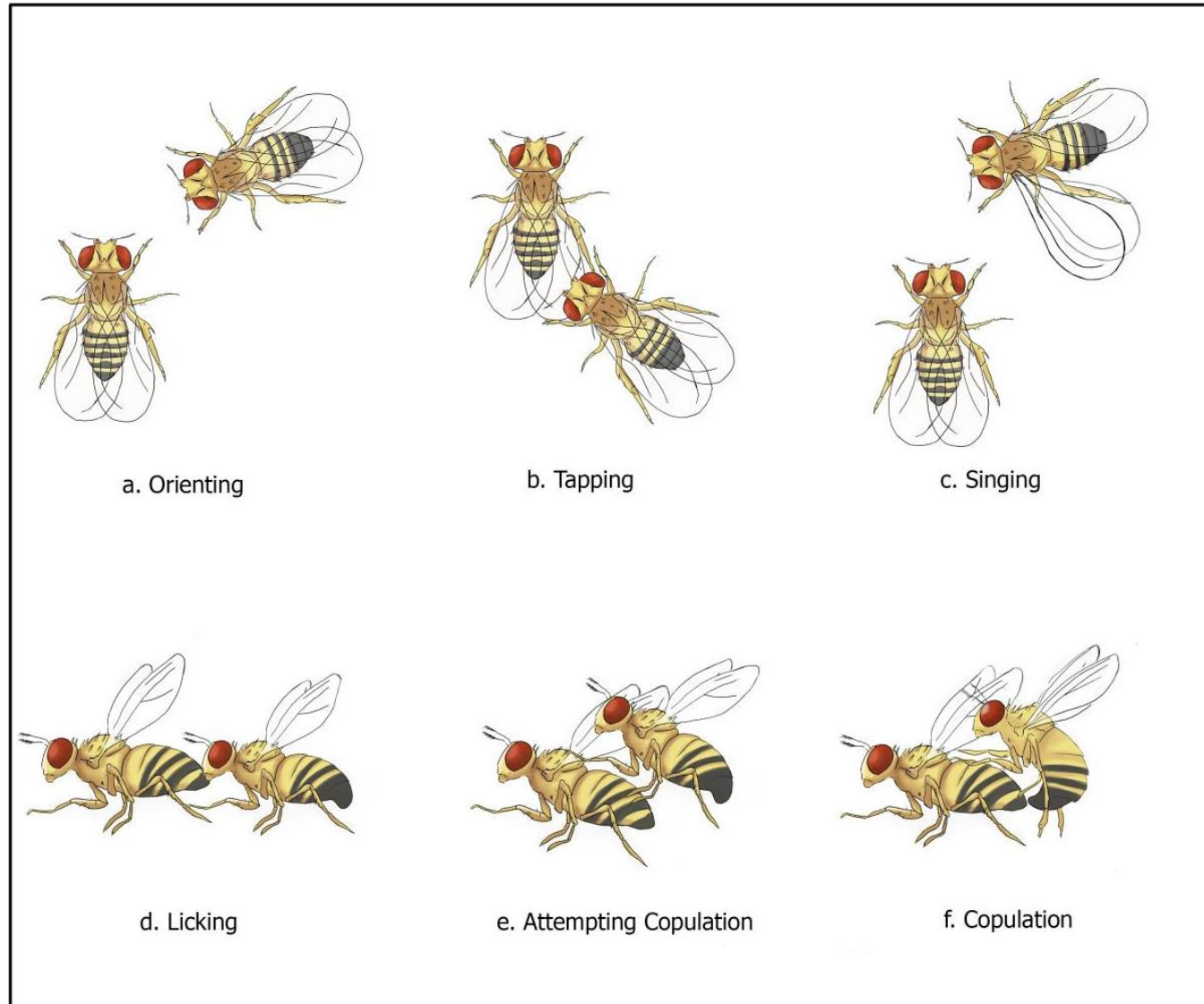


Nonvisual modalities in mate choice



Female butterflies choose mates based on the scent of male pheromones.

Multimodal courtship behaviour



Nuptial gifts



Sexual Cannibalism



Sexual Cannibalism



Sexual Cannibalism





Extended phenotypes



Extended phenotypes

