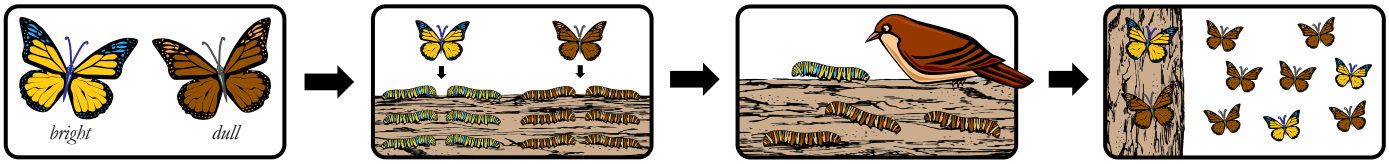
TOPIC 5.2: NATURAL SELECTION

Natural Selection

The process of natural selection occurs in response to certain conditions:

- There is genetic (inheritable) variation within a population (caused by mutations, meiosis and sexual reproduction)
- There is competition for survival (species tend to produce more offspring than the environment can support)
- Environmental selection pressures give rise to differential rates of reproduction
- Organisms with beneficial traits are likely to survive and reproduce, while those less well adapted produce less offspring
- Over generations, these beneficial traits become more common (evolution = a change in allele frequency in a gene pool)



Variation → **Competition** → **Adaptations** → **Selection**

Overview

The key components to the process of natural selection are:

- **I**nherited variation
- **C**ompetition
- **E**nvironmental selection
- **A**daptations
- **G**enotype frequency changes
- **E**volution occurs

Selection Pressures

Examples of environmental selection pressures include:

- **P**redator / prey dynamics
- **A**biotic factors (e.g. climate)
- **N**utrient supply (food source)
- **D**iseases / pathogens
- **A**vailable resources (e.g. light)
- **S**pace requirements (habitat)

Adaptations

Adaptations are traits that make an individual suited to its environment and way of life

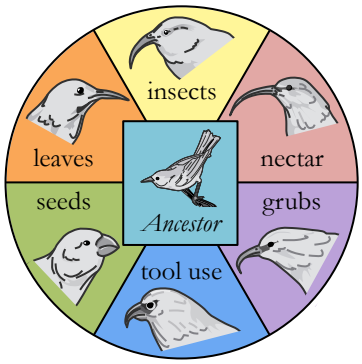
- Adaptations can be structural, behavioural, physiological, biochemical or developmental

Populations will evolve different adaptations according to environmental conditions

- The functional position of an organism in the environment is its ecological niche

When members of a species occupy a variety of different ecological niches, it will lead to the rapid diversification of the original ancestral line (this is called adaptive radiation)

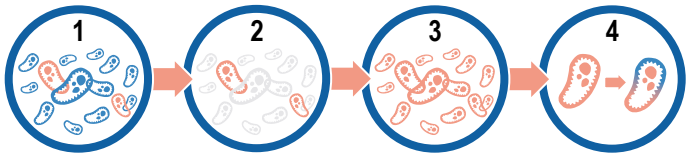
- An example of this can be seen in the changes in beaks of finches on Daphne Major



Examples of Evolution

Certain types of bacteria have developed antibiotic resistance

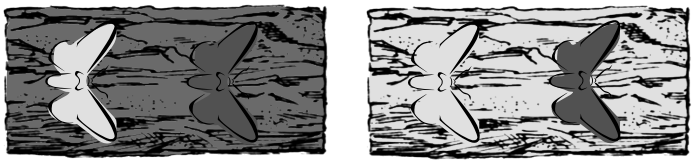
- These strains are more prevalent where antibiotics are commonly used (e.g. hospitals)



Both strains exist normally → *Antibiotics kills susceptible strains* → *Resistant strains thrive* → *Conjugation may transfer trait*

The peppered moth displays two distinct melanic forms

- The frequency of these forms has evolved with pollution levels (dark colors thrive when trees are covered in soot)



Industrial period (black moths more common)

Post-Industrial period (white moths more common)