

## 5.2 Natural Selection

### Selection Process

*Explain how natural selection leads to evolution*

There is genetic variation within a given population (which can be inherited)

There is competition for survival due to the overproduction of offspring

Environmental selection pressures lead to differential reproduction

Organisms with beneficial adaptations are better suited for survival and more likely to reproduce & pass on genes

Over generations, there is a change in the allele frequency within a population (evolution)

*Identify the three primary sources of genetic variation*

1. Gene mutations
2. Meiosis (crossing over and independent assortment)
3. Sexual reproduction (random fusion of sperm and egg)

*List three examples of selection pressures*

1. Biotic factors (predators / pathogens)
2. Abiotic factors (weather events, nutrient supply, etc.)
3. Random phenomena (e.g. fires, floods, earthquakes, etc.)

*Give examples of the different types of adaptations*

Structural: Physical differences (e.g. neck length of a giraffe)

Behavioural: Differences in activity patterns (e.g. opossums feigning death when threatened)

Physiological: Differences in responses by vital organs (e.g. homeothermy, colour perception)

Biochemical: Differences in molecular compositions / enzyme functions (e.g. blood groups, lactose intolerance)

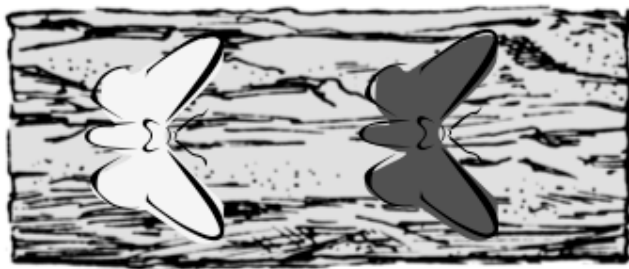
*Define adaptive radiation*

The rapid evolutionary diversification of a single ancestral line (e.g. variety of beak sizes in Darwin's finches)

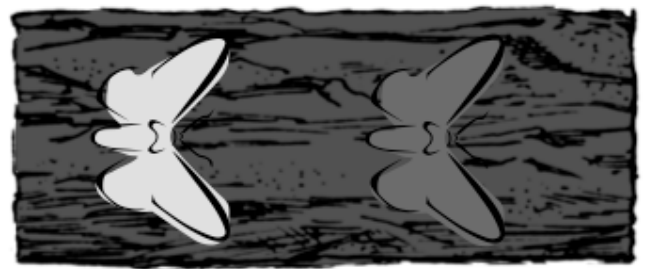
It occurs when members of a species occupy a variety of niches with different environmental selection pressures

## Selection Examples

Using the examples provided, explain how evolution occurred in response to environmental change



Pre-Industrial Revolution



Post-Industrial Revolution

Peppered Moth:

Polymorphic Variants: *Melanic coloration (light versus dark pigmentation)*

Selection Pressure: *Predation by local birds*

*When high levels of soot blackened the local trees (industrial revolution), the dark moth was better camouflaged and experienced less predation (so the dark pigmentation allele became more frequent as dark moths reproduced)*



Antibiotic Resistance:

Polymorphic Variants: *Drug-resistant versus drug-susceptible strains*

Selection Pressure: *Presence of antibiotic (e.g. methicillin)*

*If exposed to an antibiotic (methicillin), only the drug resistant strain survives*

*This increases the frequency of the drug resistant allele within the population*

*Describe the evolutionary changes to the beaks of Darwin's finches*

*Darwin's finches demonstrate adaptive radiation and show marked variation in beak size and shape according to diet*

*Finches that feed on seeds possess compact, powerful beaks (large beaks are better equipped to crack seed cases)*

*In 1977, an extended drought result in plants producing larger seeds with tougher seed casings*

*Finches with larger beaks were better adapted and thus produced more offspring with larger beaks (evolution)*