

5.2 NATURAL SELECTION

↳ proposed by Charles Darwin as 'survival of the fittest'.

↳ the ones that are the most responsive to change survive.

It occurs in response to a number of conditions:-

- inherited variation
- competition
- selection
- Adaptations
- Evolution



VARIATION

• variation among members of a species is necessary in order to differentiate survival.

- can be continuous or discontinuous.

- 3 mechanisms of genetic variation:
Mutations

• changing the genetic composition of gametes leads to changed characteristics in offspring.

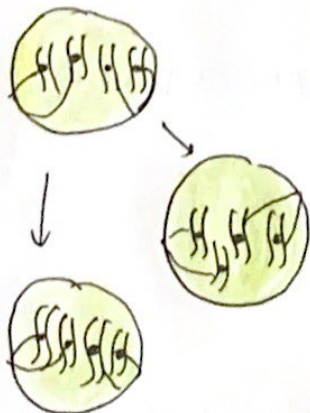
—|—|—|
G T G

—|—|—|
G A G

Meiosis

• produces new combinations of alleles by breaking up the existing combination.

- crossing over (prophase-I)
- or independent assortment (metaphase I)

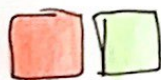


Sexual Reproduction

The combination of genetic material from 2 distinct sources creates new gene combinations in offspring.

ADAPTATIONS

- They are characteristics that make an individual suited to its environment and way of life.
- Structural - physical differences in biological structure.
- Behavioural - difference in patterns of activity
- Physiological - variations in detection & response by vital organs



- long neck

- Biochemical - differences in molecular composition of cells and enzyme functions.
- Developmental - variable changes that occur across the life span of an organism

OVER PRODUCTION OF OFFSPRINGS & DIFFERENTIAL SURVIVAL

Alleles are responsible for the genetic variation & are passed on via reproduction.

The alleles can be

beneficial

promote

neutral

not affect

detrimental

limit

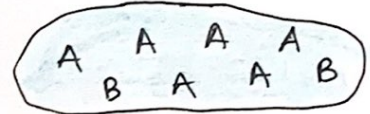
survival & reproduction

- The beneficial alleles will only survive eventually.
- Sometimes, species might produce more offsprings than the environment can handle.



- This can lead to a struggle for existence within a population.
- competition of resources

Example: southern ground hornbill



- live for 70 years
- a pair could theoretically raise 20 offsprings.

abundant resources - maximum growth rate (biotic potential)

increase in population - environmental resistance

competition - increase in mortality rates (population reaches carrying capacity).

Only the individuals that can adapt to the environment survive, the rest either die or produce less offsprings.

example - giraffes

↓
during summers,
the leaves shed &
only few remain on
the top.

↗ the giraffes with longer necks can
reach the leaves that are on
top of the tree



The giraffes with longer
necks survive better than
those with shorter
necks during food
shortage.



INHERITANCE

- Individuals that reproduce pass their characteristics to the offsprings.
- only the features that are genetic can be passed on, not the ones that have been acquired in an individual's lifetime.

SELECTION PRESSURE

- The external factors that affect an individual's chance of survival.

Predators

Resources

Nutrient supply

Disease

Accumulating wastes



Natural phenomena

Abiotic factors

Weather factors



ADAPTIVE RADIATION

- It is a rapid evolutionary diversification of a single ancestral lineage.
- It occurs when members of a species occupy a variety of niches with different environmental selection pressures.
- members evolve different adaptations due to natural selection.

Example: variety of finch beaks on daphne major