# Variation

**Variation** refers to the differences between individuals of the same species. There are three causes of variation in a species:

1. **Genetic causes**
2. **Environmental causes**
3. **A combination of genetic and environmental causes**

## 1. Variation due to Genetic cause

- **Variation** is the differences between individuals of a **population**, many of these differences are caused by **genes**, inherited from **parents**.
- **Genetics Variation:** When **gametes** from the mother and father fuse together in **fertilisation**, their **genetic information** is combined, creating a unique set of **chromosomes** and causing **genetic variation**.
- **Mutations:** Genetic variants arise due to **mutations** in **DNA**. **Mutations** occur continuously but most of them have no effect on the organism's **phenotype**. Occasionally, **mutations** will cause changes to the **protein** that is expressed and therefore change the **phenotype** of the organism. **Mutations** can cause rapid changes in a species if the new **phenotype** makes the organism more suited to an **environmental change**.
- **Example:** Characteristics in humans determined solely by **genes** include eye colour, blood group, **inherited disorders** and the ability to roll the tongue.

## 2. Variation due to Environmental causes:

- **Environmental Variation: Variation** between organisms can also be caused by **environmental differences**. **Environmental variation** covers everything that could cause organisms to be different that isn't down to **genetics**.
- **For example:**

- People living in different areas of the world have different **accents** and speak different **languages**.
- **Accidents** can cause scarring, injuries or even loss of limbs.
- **Plants** grow more healthy when they have lots of **light** than in the dark.

## 3. Variation due to combination of genetic and environmental causes

- Most characteristics are due to interactions between both **genetic** and **environmental** factors.
- How **tall** a human can potentially grow is determined by its **genes**, inherited from its **parents**. However, if they have a poor **diet**, they will struggle to grow to their full capacity so will be **shorter**.
- **For Example : body weight** and **skin colour**.