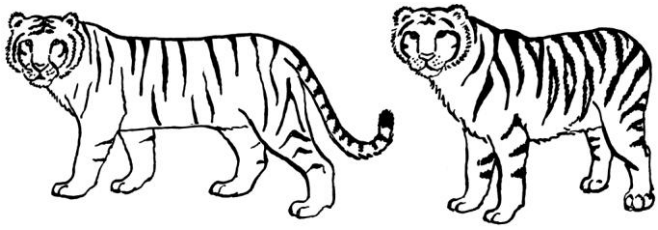
A **species** is a group of organisms that are able to reproduce to give offspring that are also able to reproduce. Members of the same species have very similar **characteristics** (features). However, there is **variation** in these characteristics.



All tigers have stripes but there is variation in the stripes between each tiger.

Environmental variation

Some characteristics vary due to **environmental factors** in an organism's surroundings (its **environment**). There are living environmental factors (other organisms) and **physical** (non-living) **environmental factors**, such as the amount of sunlight. Variation caused by environmental factors is **environmental variation**.

All the organisms and physical environmental factors in an area form an **ecosystem**.

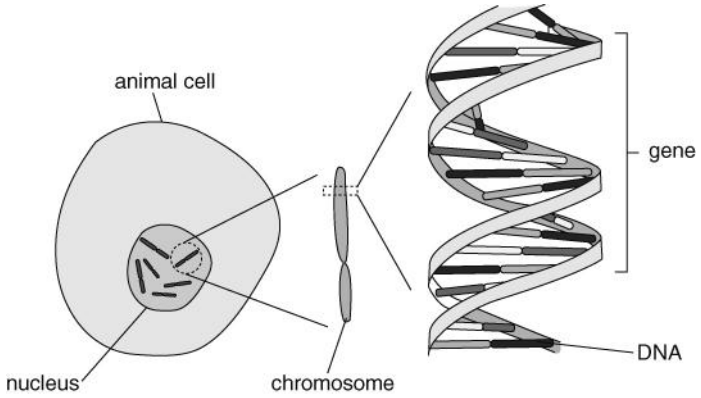
Inherited variation

Offspring **inherit** characteristics from their parents and these characteristics can vary (e.g. brown eyes and blue eyes). This is **inherited variation**.

Chromosomes, genes and DNA

An organism's characteristics are controlled by **genetic information** contained in a code in **DNA**. James Watson and Francis Crick discovered the structure of DNA by making use of the data of other scientists, such as Rosalind Franklin and Maurice Wilkins.

Each **chromosome** contains a long molecule of DNA. Certain sections of that DNA molecule contain the genetic information and are called **genes**.

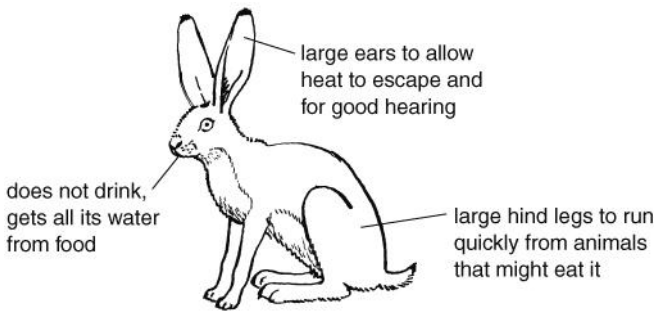


In humans there are 23 different types of chromosome. Most cells have two copies of each type. Gametes, however, only have one copy of each type of chromosome. When two gametes fuse during **fertilisation**, they form a zygote that contains the chromosomes from both gametes.

For some characteristics, scientists can work out the **probability** that a child will inherit that characteristic. Probabilities are shown as percentages, decimals or fractions.

Adaptation

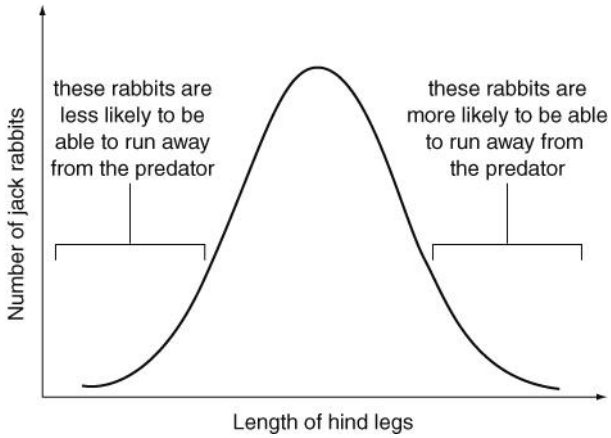
Animals and plants are **adapted** to where they live; they have characteristics that allow them to survive in that habitat.



Jack rabbits are adapted to living in a desert habitat.

Natural selection

All characteristics vary slightly amongst the members of a species. We can often draw a bell curve (**normal distribution**) to show variation in a characteristic.



If conditions in a habitat change, then variation in a characteristic may help some members of a species to survive better than others. Imagine a new predator moves into the area in which jack rabbits live. By chance, some jack rabbits will have slightly longer hind legs that allow them to run faster. These are the jack rabbits that are more likely to survive and reproduce. So, the next generation of jack rabbits will have slightly more rabbits with longer hind legs.

This process is known as **natural selection**. Charles Darwin and Alfred Russel Wallace both came up with the idea that it is natural selection happening over and over again, over a long period of time, that causes **evolution**.

Endangerment and extinction

Changes in an **ecosystem** can cause species to become **endangered** or **extinct**. This is usually due to:

- changes in physical environmental factors
- competition from other organisms
- disease
- human activities (e.g. hunting, clearing habitats, using poisons).

We can try to stop this happening and preserve **biodiversity** (the number of species) by:

- protecting areas and setting up nature reserves
- setting up breeding programmes in zoos
- banning the hunting of some animals or the collecting of wild plants
- setting up **gene banks** (to store parts of organisms, such as seeds and gametes).

We should preserve biodiversity because:

- organisms depend on one another (they are **interdependent**)
- we won't be able to make use of organisms if they become **extinct**
- more biodiverse areas recover better from natural disasters.