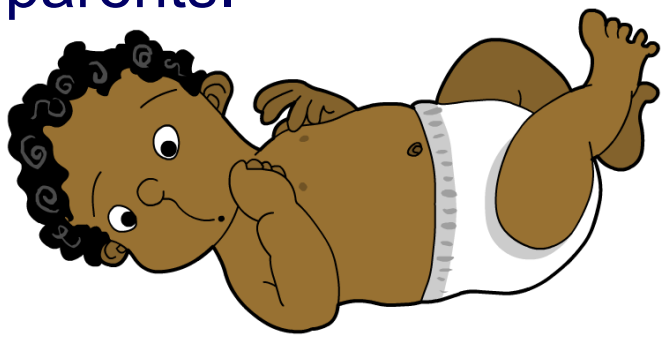
Environmental Variation

Uniquely you…

The population of the Earth is more than 6 billion people, and no two individuals (apart from identical twins) are genetically the same. Why?

People are different because they inherit different **characteristics** (or traits) from their parents.

Like all babies, this child carries a unique set of genes; half from his mother and half from his father.

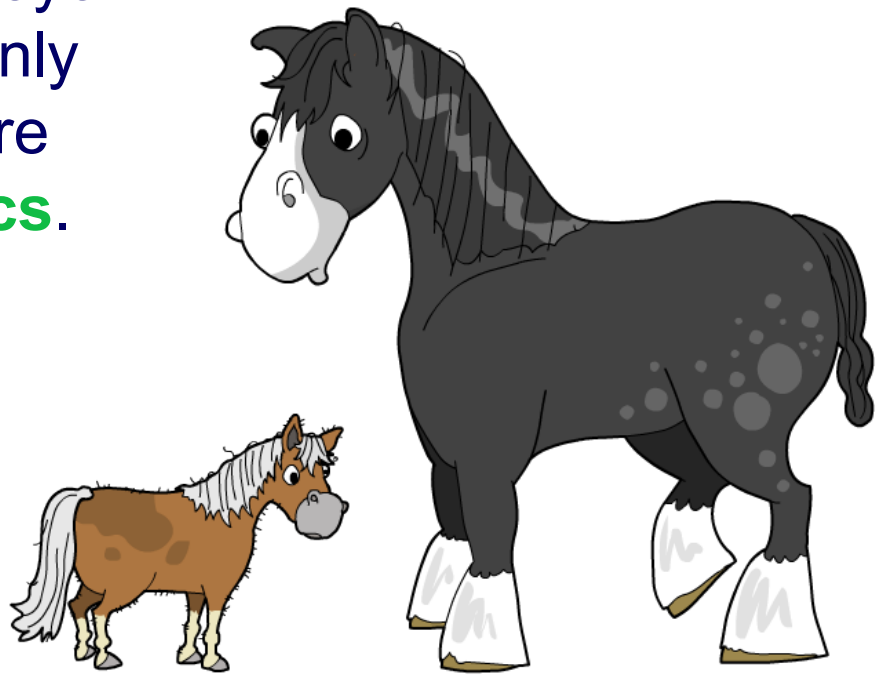


A person's unique characteristics are caused by:

- the set of **genes** they inherited from their parents (nature)
- the **environment** in which they developed (nurture).

Inherited and acquired characteristics

Some characteristics, such as eye color and earlobe shape, are only determined by genes. These are called **inherited characteristics**.

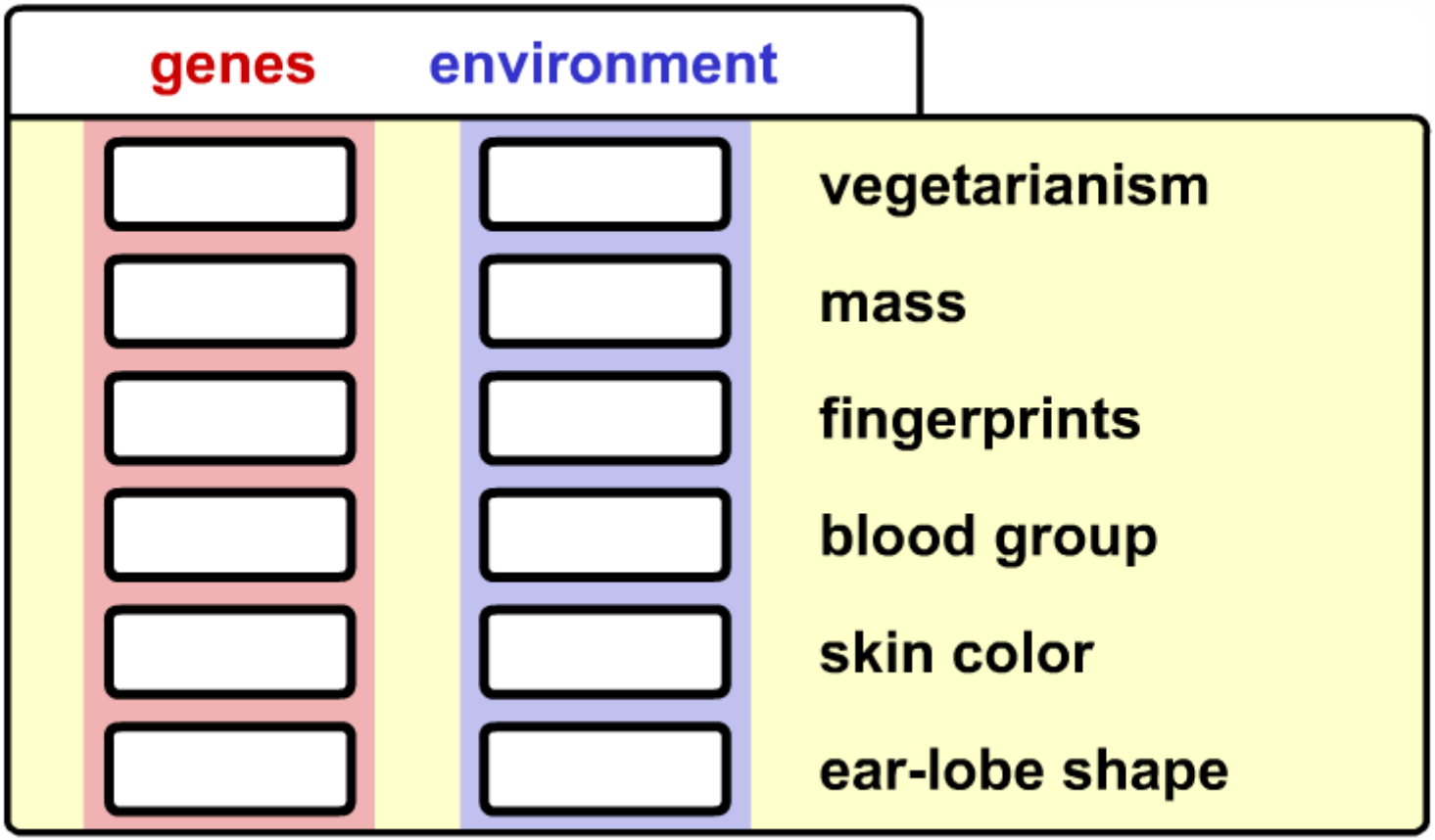


Other types of characteristics, such as scars and hair length, are not inherited but depend on environmental factors. These are called **acquired characteristics**.

Differences in some characteristics are due to a combination of **both** inherited and environmental factors. In some cases, it can be difficult to say how much influence each factor has.

Nature, nurture or both?

What has caused variation in each of these characteristics?



Phenotype and genotype

The **overall** appearance of an organism depends on two things:

1. its genes (inherited characteristics)

2. the effects of the environment in which it lives.

All the observable characteristics of an organism are called its **phenotype**.

The full set of genes of an organism is called its **genotype**.

An organism's phenotype therefore depends on its genotype **plus** environmental effects.

phenotype = genotype + environmental effects

Environmental causes of variation

The effects of the environment in which an organism lives can cause significant variation between individuals.

Plants are affected by water, sunlight, temperature and the availability of nutrients.

When these factors are plentiful the plants thrive.

When these factors are scarce the plants wither.

Animals are similarly affected by water and nutrients.

Observing variation in humans

As well as environmental factors such as climate and diet, humans are affected by education, culture and lifestyle.

Because these factors change our phenotype, the effects of many environmental factors can be clearly seen.

Scientists often use identical twins to study the effects of environmental factors.
Although the twins are genetically identical, each one will have been shaped differently by his or her environment and experiences.

For example, a bad diet may cause one twin to be larger and less healthy than the other twin.