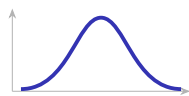


## Variation & Selection

IGCSE Biology ■ Topic 18

IGCSE Biology



### Variation & Selection

#### What we will cover

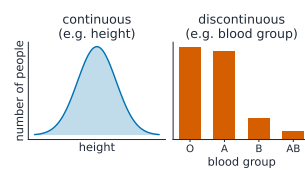
- 1 Variation
- 2 Mutation & adaptation
- 3 Natural selection
- 4 Examples
- 5 Selective breeding

# 1 Variation

### Variation & Selection

#### └ Variation

#### Variation



- **continuous variation** 连续变异 – a smooth range of **phenotypes** 表现型 between two extremes (for example body length and body mass).
- **discontinuous variation** 不连续变异 – a few separate phenotypes with nothing in between (for example **ABO blood groups** 血型, or seed shape in peas).

### Variation & Selection

#### └ Variation

#### Mutation and adaptation

original: A T G C A → a change in the  
mutated: A T T C A bases = a new allele

- **continuous variation** 连续变异 – a smooth range of **phenotypes** 表现型 between two extremes (for example body length and body mass).
- **discontinuous variation** 不连续变异 – a few separate phenotypes with nothing in between (for example **ABO blood groups** 血型, or seed shape in peas).

# 2 Selection

Variation & Selection  
└ Selection

Natural selection

variation in the population

more offspring than can survive

struggle to survive (competition)

best-adapted survive & reproduce

their alleles are passed on

over many generations the population becomes better adapted

**Natural selection** 自然选择:

- 1 variation in the population
- 2 more offspring than can survive
- 3 **competition** 竞争 to survive
- 4 **best-adapted** 适应 survive & breed
- 5 helpful alleles spread

Variation & Selection  
└ Selection

Examples



The dark **peppered moth** 桦尺蛾 was favoured on soot-darkened bark.

**Antibiotic** 抗生素-resistant bacteria are natural selection happening fast.

Variation & Selection  
└ Selection

Selective breeding

choose parents with the wanted **feature**

breed them together

choose the **best** offspring

improved crop or animal

repeat over many generations

In **selective breeding** 选择育种, humans choose which organisms breed, over many generations (better crops & animals).

Natural selection: the **environment** decides. Selective breeding: **humans** decide.

humans choose which breed (not the environment)

3

Recap

Variation & Selection  
└ Recap

Worked example – explaining natural selection

Dark moths became common in a sooty industrial area. Explain using natural selection.

- **Variation**: the population already had pale and dark moths (from mutation).
- Soot darkens the bark, so **dark moths** are better camouflaged.
- Birds eat more pale moths ⇒ dark moths **survive and reproduce**, passing on the allele.
- Over many generations, **the dark allele** becomes more common.

Four steps, always: **variation** → **selection pressure** → **the better-adapted survive and breed** → **the allele's frequency rises**. Name the pressure.

Variation & Selection  
└ Recap

Topic 18 – key takeaways

1 **Variation**

continuous (range) vs discontinuous (groups)

2 **Mutation**

makes new alleles – the source of variation

3 **Natural selection**

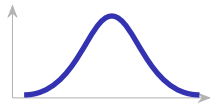
best-adapted survive & pass on alleles

4 **Breeding**

humans choose the parents

## Check yourself

- 1 Which variation gives a smooth range?
- 2 What is the original source of all variation?
- 3 Who survives in natural selection?
- 4 Who chooses the parents in selective breeding?



**Answers** 1. continuous variation 2. mutation 3. the best-adapted 4. humans