



# Science

## Evolution and Inheritance



# Adaptation, Evolution and Human Intervention

# Aim

- I can explain how adaptations can result in both advantages and disadvantages.
- I can explain how human intervention affects evolution.

## Success Criteria

- I can understand that some living things have acquired more adaptive traits than others.
- I can identify advantages and disadvantages of specific interventions.
- I can explain how humans have created new varieties of living things through selective breeding.
- I can demonstrate understanding of the issues raised by human intervention in the evolutionary process.

# Adaptation



Read and discuss the following statements.

Are these statements true or false? Explain why to your partner.

Some living things have a greater number of adaptations.  
**TRUE**

All adaptations enable living things to survive better.  
**FALSE**



Click the statements to see if they are true or false.

All living things have a similar number of adaptations.  
**FALSE**

Not all adaptations give living things an advantage. Some can cause disadvantages as well.  
**TRUE**

# Adaptation and Evolution

Remember that **adaptation** is the result of mutations which occur **randomly**.

These can result in **adaptive traits** which confer the living thing with a function that enables it to survive better.

However, the adaptive trait could also do the complete opposite and involve losing a function.

In some cases the adaptive trait neither confers an advantage or disadvantage. It has a neutral effect!

# Adaptation and Evolution

Adaptation by natural selection results in evolution if the following 3 conditions are met:

**1) The mutation causes a variation in an existing trait.**

(The trait exists already, not an entirely new one which is rare).

**2) This trait is heritable.**

(It can be passed on from parent to offspring. Some traits are dependent on DNA in more than one gene. If the offspring does not inherit all of those genes and DNA then the trait will not be passed on to them.)

**3) This version of the trait enables a greater chance of survival than other versions of the trait.**

(Having thicker fur is an adaptation that has enabled animals in colder parts of the world to survive better so animals with thinner fur became extinct in those parts of the world. Being taller or shorter as a human confers no advantage in terms of survival and therefore the different versions of this trait have continued to exist.)

# Living Fossils

All living things have not adapted or evolved to the same extent.

A living fossil is a living species that is highly similar to its ancestors found in fossils. These living things have either had little occurrence of adaptation or the adaptations that did occur did not prove to be an advantage so died out.

Examples of living fossils include:

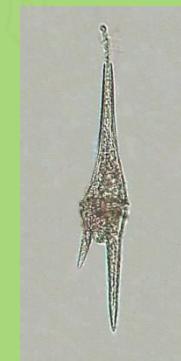


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# Advantages and Disadvantages of Adaptation

It is rare that an adaptation will have a completely positive or negative effect on the living thing. Often the adaptive trait confers an advantage but can cause other disadvantages, even if these do not harm the chances of the living thing's survival.

Use the following activity sheet to cut out and match the advantages and disadvantages caused by specific adaptive traits.

## Advantages and Disadvantages of Adaptation

Cut out and match an advantage and a disadvantage for each adaptive trait.

Advantage	Adaptive Trait	Disadvantage



# Evolution and Human Intervention

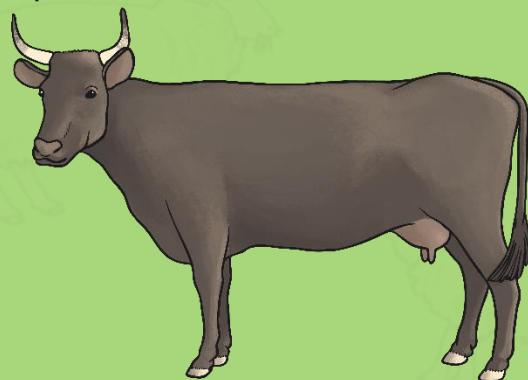
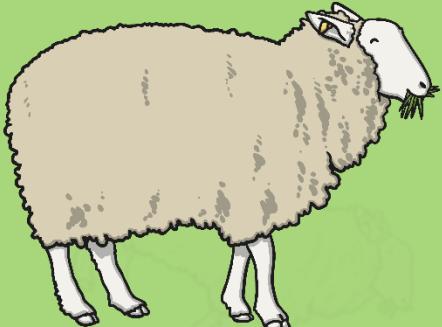
Human beings are unique among living things in their ability to affect the evolutionary process of natural selection. They have done this through a process called **selective breeding**. There is evidence from as long ago as 7000BC that farmers were selectively breeding plants and animals.

**Selective breeding** (or **artificial selection** as it is sometimes referred to) involves humans deliberately breeding plants and animals to produce **particular characteristics**. This results in **new varieties** of plants or **breeds** of animals.

# Evolution and Human Intervention

Examples of selective breeding include cows that can produce more milk, sheep with thicker coats of wool, wheat that produces more grain and different colouring in flowers.

There is **no evolutionary advantage** to the living thing from the selective breeding process. If there had been, these characteristics would have occurred through the natural selection process.

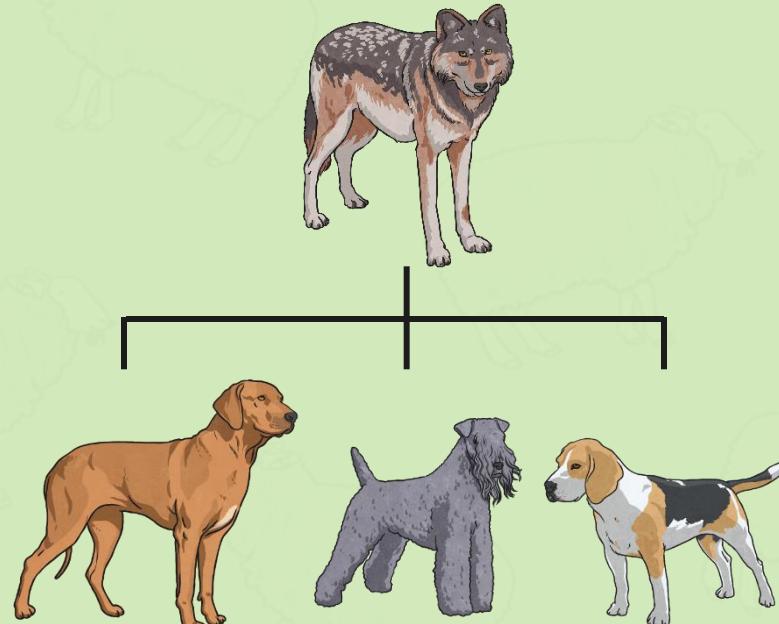


# Selective Breeding

## Process of Selective Breeding:

1. Decide which characteristic is important e.g. amount of milk produced.
2. Find parents who show this characteristic.
3. From their offspring, choose the ones who share this characteristic and only let them reproduce.
4. Repeat the process continuously.

Selective breeding produces new varieties of an existing **species**, not new species.



# Cross Breeding



**Cross breeding** is a process through which two parents from the **same species** are bred in order to combine particular characteristics from each parent.

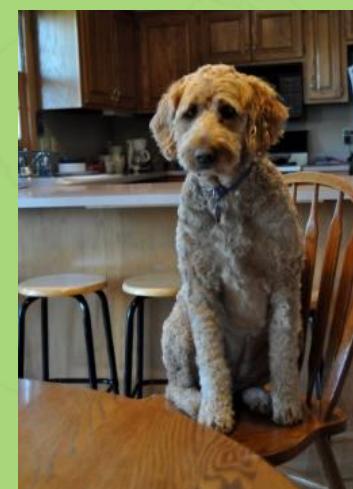
The process is very similar to the selective breeding process, except the offspring must have the selected characteristics from **both parents**.



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**Poodle**

**Labrador**

**Labradoodle**

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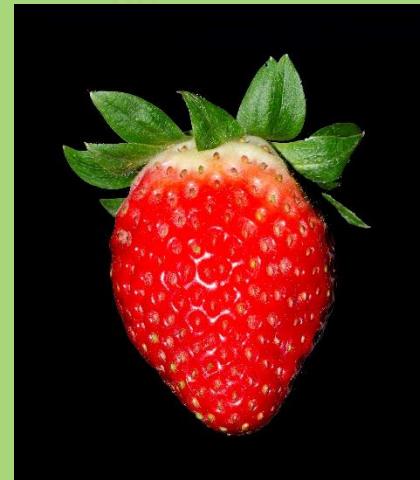
# Cross Breeding



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*Fragaria Chiloensis*

*Fragaria  
Virginiana*

*Garden  
Strawberry*

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# Selective and Cross Breeding

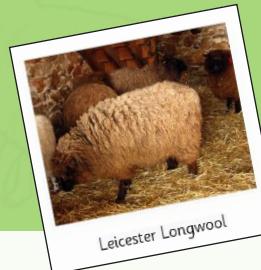


In your group, use the Selective and Cross Breeding Cards to match the parent(s) with the offspring that has been selectively bred.

Remember: in some cases the **selective and cross breeding** processes will have taken place over long periods of time so we are looking at the original parent and the current offspring as a result of this process.

Set out the cards as a Carroll Diagram (see below).

	Parent(s)	Offspring
Selective Breeding		
Cross Breeding		



# Selective and Cross Breeding Cards Answers



	Parent(s)	Offspring
Selective Breeding	Wild Mustard Plant	Broccoli
	Teosinte	Sweetcorn
	Lincoln Longwool	English Leicester
	Draught Horse	Shire Horse
Crossbreeding	Flagaria Chiloensis and Fragaria Virginiana	Garden Strawberry
	Poodle and Labrador	Labradoodle
	White Carrot and Yellow Carrot	Orange Carrot
	Goldfinch and Canary	Mule

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