



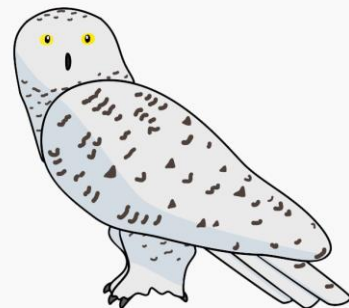
Evolution

Secondary Activity Pack

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Background information

- 4th Century BC Aristotle writes "History of Animals" . This model remains largely unchanged until the 16th Century.
- 1551 Gessner publishes History of Animals in Zurich.
- 1738 Linnaeus published his system of classification of species.
- 1795 Hutton proposed the idea that the Earth was shaped by gradual forces.
- 1796 Cuvier published his theory that fossils were from species that had become extinct.
- 1798 Malthus' Essay on the Principle of Population is published.
- 1809 Lamarck's theory of evolution published — Darwin born.
- 1830 Lyell proposed his geological theory of uniformitarianism.
- 1831 Darwin set out on the voyage of the Beagle.
- 1858 Wallace wrote to Darwin setting out his theory of natural selection. Darwin's and Wallace's ideas were presented to the Linnaean Society of London.
- 1859 Darwin published the Origin of Species.
- 1865 Mendel's experiments on heredity published.

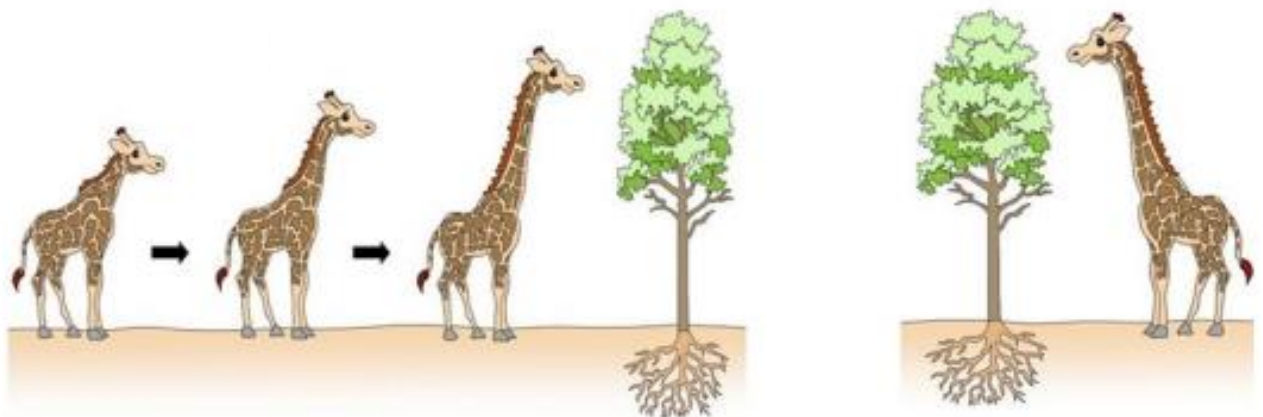
Background information

Jean-Baptiste Lamarck 1744 – 1829

Lamarck was a French Naturalist and an early proponent for the idea of evolution. His theory suggests that life started off simple and became complex over time, moving up a 'ladder' of progress.

1809 he published *Philosophie Zoologique*, which he theorized that change was gradually introduced into the species and passed down through generations. The classic example used to explain the concept of use and disuse is the elongated neck of the giraffe (see below).

According to Lamarck's theory, a given giraffe could, over a lifetime of straining to reach high branches, develop an elongated neck. A major downfall of his theory was that he could not explain how this might happen, though he discussed a "natural tendency toward perfection."



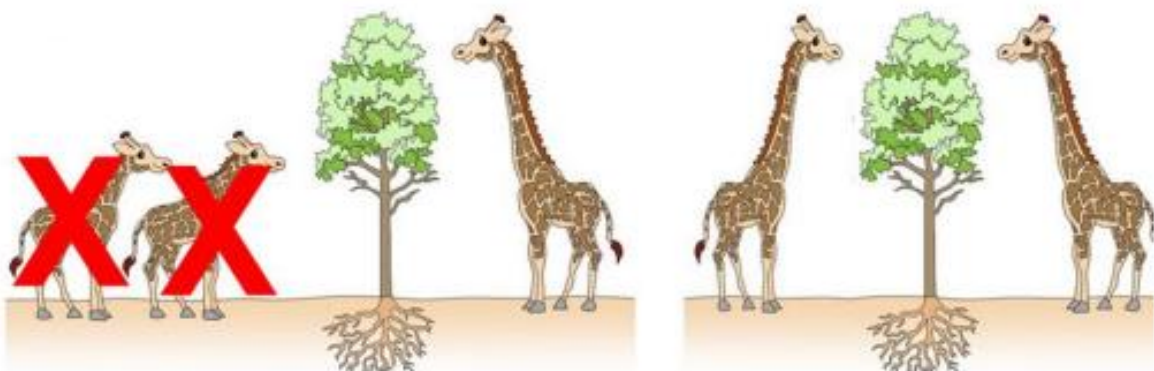
Background information

Charles Darwin 1809–1882

Darwin was an English naturalist and Geologist and is renowned for his evolutionary theories. He originally trained in medicine but was much more interested in studying the natural world.

In 1831 he became the naturalist for a scientific expedition on board the HMS Beagle and discovered many new species and formed new evolutionary theories whilst travelling the world. Darwin suggested that all species are descended from common ancestors.

He and his partner Alfred Wallace also produced a joint publication that the branching pattern of evolution was due to a process known as natural selection, where by the animals most suited to their environment are the ones that survive and continue to adapt (see below). He published his famous work *On the Origin of Species* in 1859.

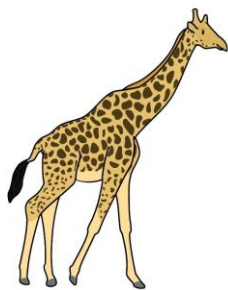


Pre-visit activities

Below are some ideas for classroom activities linked to evolution and classification.

1. Learn the vocabulary words from the list on the next page.

Make it fun and interesting, you could create word clouds, use sticky notes, vocabulary spirals, hangman or pictionary!



2. Explore the history of Charles Darwin.
Create a storyboard or cartoon strip of his life leading up to the creation of his famous work the Origin of Species.

3. Research animals with unique evolutionary traits and adaptations before their visit to the Park.
Create a 'fun facts' page for one of the animals.



Vocabulary

Adaptation	The process of change by which an organism or species becomes better suited to its environment
Camouflage	Colours and patterns that help an animal blend in to its surroundings
Carnivore	An animal that mainly eats meat
Classification	The process of organising things into classes or categories
Darwinism	The theory of the evolution of species by natural selection
Endangered	Very few left/faces major threats and might become extinct
Evolution	The process by which different organisms are believed to have developed from earlier forms during the history of the Earth
Extinct	The species no longer exists (died out)
Habitat	The type of place an animal lives eg: rainforest, desert
Herbivore	An animal that mainly eats plants
Natural Selection	The process whereby organisms better adapted to their environment tend to survive and produce more offspring
Omnivore	An animal that eats both meat and plants
Predator	An animal that hunts and eats other animals
Prey	An animal that is hunted and eaten by other animals
Species	A group of animals that have similar characteristics and can produce offspring
Taxonomy	The classification of something eg: organisms
Vertebrate	An animal distinguished by the presence of a backbone or spinal column (including mammals, birds, reptiles, fish and amphibians)
Invertebrate	An animal lacking a backbone – such as arachnid, arthropod, mollusc, annelid

Pre-visit activity: Sweet Natural Selection

This edible activity gives students the chance to understand the basics of Darwin's theory of natural selection.

Time: 1 hour **Subjects:** Science

Materials Required: large bowl, a wide variety of sweets.

For this activity, you will need a large bowl and a mixture of different types of sweets. These should include popular sweets such as gummy bears, as well as less popular choices like black liquorice.

- Make sure you have a list of exactly how many of each sweet you have. Without providing an explanation, pass the bowl around the classroom, asking each student to take one sweet. This can be repeated a couple of times until the bowl is half full.
- Once this is done, begin to explain about variation—ask students to think of the variation between their classmates, for example. Ask them why this is significant— it should result in a discussion about different traits being important for survival.
- Examine what sweets are left in the bowl with the class. Make a list and a tally of these on the board. Then create a list of the original sweets. Then ask the students to list the traits the sweets that they tried (flavour ,texture, colour etc.) These can then be compared to the traits of the sweets left in the bowl.
- Make a list of the traits of the sweets that were selected(examples: bad flavours, small size). These are the traits that allowed the sweets to survive being passed around the room. The fact that there were different sweets with different traits resulted in some sweets being eaten and others surviving. This is what natural selection does with individuals in a population. Each individual has unique traits; some traits will help an individual survive and some traits do not.

Pre-visit activity: The Great Debate

When Darwin published his 'The Origin of Species' he created an uproar in the academic community.

This activity will help students to understand why Darwin's Theories were so revolutionary and encourage them to think about why he changed the world.

Time: 1 hour **Subjects:** English, Citizenship, History, Science

Materials Required: For this activity, the class will need to be split into 4 groups, and given one of these famous historical characters to research:

- **Charles Darwin:** Darwin claimed that his publication of *The Origin of Species* was like "confessing to murder", and was fully anticipating backlash from the scientific community. He largely tried to stay away from the debates, as he was more concerned over what was thought of his science rather than involving himself in politics and rhetoric.
- **Richard Owen:** an old colleague of Darwin's, who was deeply critical of his work. He believed that evolution was much more complicated than Darwin suggested. He was well known for his vicious temperament.
- **Bishop Samuel Wilberforce:** Coached by Owen, Wilberforce was strongly against Darwin's theory as it stood against the church. He was one of the main antagonists in the great debate, battling against Huxley at the 1860 meeting of the British Association for the Advancement of Science.
- **Thomas Huxley:** a very outspoken support of Darwin's Theory. He was nicknamed "Darwin's Bulldog." He stood up for Darwin during the great debate, as Darwin was sick on the occasion.

Have students collect quotations and publications from this time, and then stage an in class debate. They should be expected to provide strong evidence to back up their arguments. An extension of this activity could be to create 1800s style newspaper articles to either condemn or celebrate Darwin's Theory.



At the Park

Below are some ideas for things you can do or be looking for during your visit.

1. Make a detailed sketch of an animal. Sketching encourages careful observation.
2. Attend the public talks and have your students take notes. Often the keepers are available after to answer questions if you want to learn more.
(We currently have two public talks: Penguins and Lemurs)
3. As you go around the Park make a list of animals you think share a common ancestor. Once back at school discuss the students' findings.
4. Split into 4 groups and get each group to go around and find out about evolutionary adaptations of animals from particular regions eg:
Africa, Asia, South America and Europe.
Or by habitat: Rainforests, rivers/lakes, deserts/savannahs and dry forests.

Post-visit activities

Below are some ideas for classroom activities that will support the students' learning around evolution.

1. Choose a species from the Park and research its evolutionary history and create a timeline for that animal.
Extension: research multiple animals.

2. Identify an animal that has not changed for millions of years and discuss why they have not changed for so long.
This can be done in poster form or as a presentation.

Extension: discuss if that animal could survive a major event such as climate change or a rapid decline in food or habitat.
(Look into the animals' past. Has it survived a previous event?)



3. Create a poster for how island evolution can cause unique animals and plants. Australia and Madagascar are good examples.

Post-Visit Activity: Battle of the Beaks

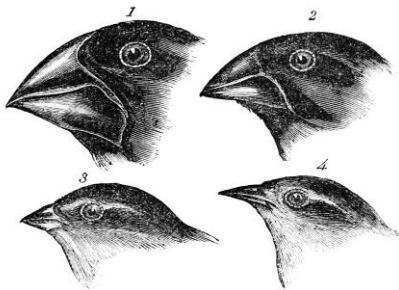
This activity can help show how different bird species have adapted to have different shaped beaks and how the beak helps them to survive in their natural habitat.

Time: 60 mins

Subject: Science

Apparatus needed: 7 pairs of scissors,
7 tweezers
7 teaspoons
7 clothes pegs
28 plastic beakers/cups

Materials needed: large paperclips, large rubber bands, toothpicks, small pasta, marbles, mini marshmallows, peas/baking beans



The birds in the image are known as Darwin's finches and are found in the Galapagos Islands. They were first collected by Charles Darwin during his voyage on HMS Beagle. The birds have developed highly specialised beak shapes, depending on the food available on each island.

In any habitat food is limited and the types of foods available will vary. Animals with specific adaptations will be more likely to survive as they can access the food available.

Activity: To mimic different birds and how they would feed, use the different apparatus to create a 'beak' and try to pick up the different materials. Which 'beak' works best for which material? Why?

Research different beak shapes before-hand eg: Spoonbills, Cattle Egrets etc.

Post-Visit Activity: An Arms Race Top Trumps

This activity can help show how predator and prey animals compete in a race for survival to try and best each other.

Time: 45mins designing. 10mins playing the game.

Subject: Science

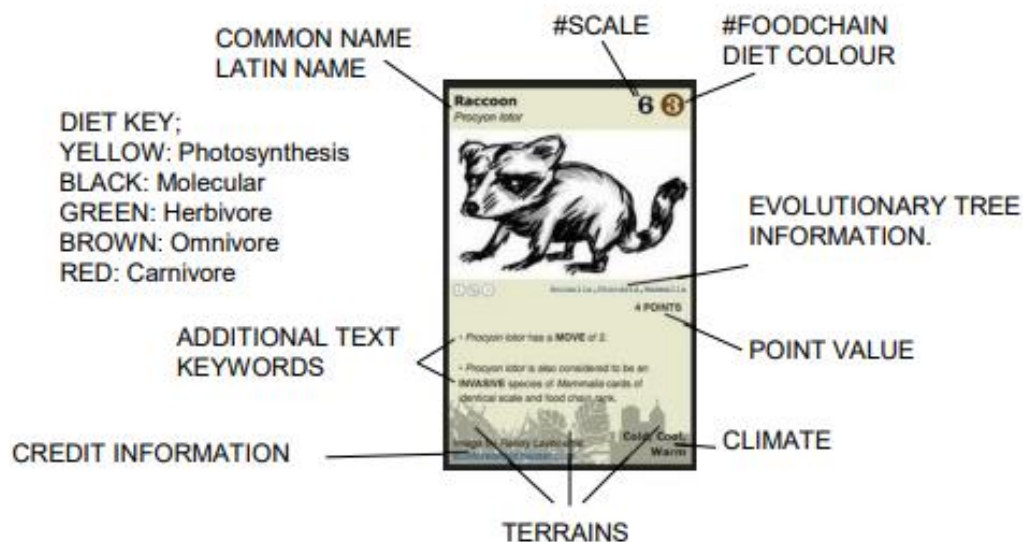
Materials needed: Paper, pens, printer

Divide the class into half and have one half create imaginary herbivores and the other half create imaginary carnivores. Can either create one each or work in small teams.

To ensure clarity the teacher can come up with categories and rules. Key aspects to include are:

- What defenses the animal would have—i.e. horns, camouflage, living in groups etc
- What weapons—i.e. types of claws, size of the teeth etc
- Tactics—i.e. ambush or living in groups etc.
- Once the cards have been created play rounds until you have winner!

Don't forget the birds, fish and other animals, not just mammals. The students can also research real animals and create top trump cards on these animals. Below is an example of the type of playing card the students could create and on the next page is a template page.



Species:

Category
(diet/speed/ferceness etc)

Score

Species:

Category
(diet/speed/ferceness etc)

Score

Species:

Category
(diet/speed/ferceness etc)

Score

We hope you enjoy your visit to Cotswold Wildlife Park and that you find some of these activities useful for your class.

We always enjoy seeing examples of students using the resources we have provided and the learning evident, so if you would like to send us some photos of their finished work, please email activities@cotswoldwildlifepark.co.uk

Thank you

