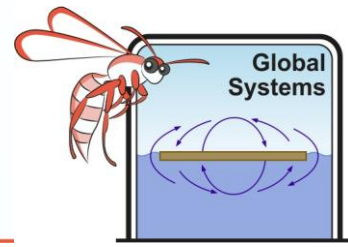


Megafauna – Teacher Notes



There is often much discussion amongst scientists as to the cause or causes for global extinctions such as the one in which the dinosaurs became extinct. It occurred many millions of years ago so reliable information may be difficult to find, to measure and to interpret. In the past people have suggested that dinosaurs were suddenly and catastrophically wiped out by one of the following forcing factors:

- Climate change
- Volcanic eruptions and the fires they started.
- Noah's flood
- Asteroid impacts



Current research indicates that this global extinction event was not the result from one single catastrophic change. It occurred over 50 million years and was probably caused by a combination of cyclical climate warming enhanced by volcanic outgassing and that at various locations asteroid and meteorite impacts happened at different times.

Analysis of data from more recent rocks, marine sediments and ice cores indicates that single major forcing factors such as CO₂ outgassing from volcanoes increasing atmospheric and marine temperatures, changes in marine acidity because of increased atmospheric CO₂, and tectonic movements causing changes in marine current flow and heat distribution patterns have happened many times during Earth's history without immediate catastrophic results. Rather that a "tipping point" appears to have been reached as a consequence of interaction between many factors. Analysts suggest that although single forcing factors may be responsible for local changes in climate, vegetation and biodiversity there is no evidence of their causing great global extinctions.

Tipping points may be reversible. A case in point is the Pleistocene and Recent history of northern and central Australia where a variety of minor factors acting together has caused periods of alternating increase and decrease of rainfall. Vegetation has "flipped" between being savannah to rainforest to savannah to becoming rainforest and back again. The arid phase coincided with the loss of most of Australia's megafauna.

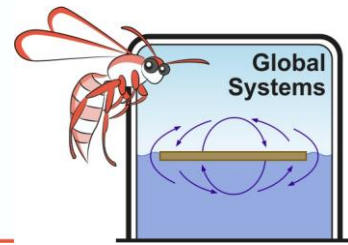
Piltdown Man

Often explanations are influenced by current beliefs and values. Our Australian Curriculum requires students to be able to make up their own minds based on the source and quality of data available. Sensible scientists are skeptical. In a famous case in Victorian England some hoaxer took the skull of a modern human and the jaw of an ape and "planted it" in Piltdown quarry. There had been much discussion on the possible evolution of humans from apes. Up until then no evidence had been found to support that view. The Piltdown man" appeared to provide the missing link in the chain of evolution. Discoveries of other skulls of our ancestors have since shown that humans and apes have a common ancestor. The hoax was later uncovered when fluorine dating clearly demonstrated that the two bones were of different ages and came from different geographical sources. This had already been suspected as the bones were quite differently weathered and the jaw was much more robust than the skull. Geology students were suspected of planting it as a prank.

Why do you think the hoaxer planted the skull? [To support the idea of evolution from apes. To make fun of the idea that humans evolved from apes. To confuse their professor. Fun.](#)

How can you select reputable sources of information when you use the Internet? Write down 5 ways of making sure you are using good sites.

[First check that what is written makes sense to you. Use reputable sites, check qualifications of writer, cross reference information sources, keep skeptical, consider writer's bias.](#)



Megafauna – Teacher Notes

The extinction of Australian megafauna

As recently as 50,000 years ago Australia was home to many species of megafauna. Megafauna are species with a body mass over 45kg or being 30% or more massive than their present relatives. Giant marsupials such as Diprotodon, an herbivore, 2m tall, 3m long and weighing 2,700kg roamed the forests whilst Thylacoleo, a marsupial lion, hid up in the branches to jump down on its prey. Thylacoleo had massive jaws three times more effective than any recent lion. By about 40,000 years ago 90% of our megafauna was extinct. The remnant population of red kangaroos, emus and saltwater crocodiles are all that now remains of this group.

For comparison you have been given a photograph of a fossilised Diprotodon skull found in Victoria and dated at 50,000 years ago and another of a horse skull found at 80 Mile Beach on the north coast of Western Australia.



Skull found in Victoria (megafauna, Diprotodont) and recent horse skull found at 80 Mile Beach near Broome

What information do you need before you even start to compare these skulls?

Source Why should I value the information from the person who took the photographs?
Source of skulls known. Picture from reputable scientist

Scale Are both pictures to the same scale - - are they physically comparable? YES

Integrity Have any changes been made in the data to suggest a bias of interpretation? NO
Both are to the same scale and have not been interfered with. (Actually the skull on the right has had teeth removed to test the effect of Coca Cola on teeth – seriously erosive).

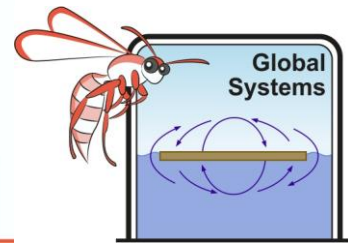
How old can the horse skull be? Explain your answer. About three hundred years. Post arrival of European settlers.

Are both skulls from the same type of creature? No. Although they have similarities, they have many obvious differences. One is from a mammal and the other is from a marsupial.

How can we use the modern horse skull on the right to interpret the life of the animal whose skull is on the left? What clues can we use?

1. Both are herbivores having sharp chisel shaped front teeth (incisors) for cropping grass and leaves and large rear teeth (molars) for grinding them to release their goodness. The classic gap between both teeth is the diastemat that allows animals to rotate their lower jaw – chew. These were both animals that grazed on grasses for their food source – herbivores.
2. Both skulls are approximately the same size suggesting the animals are about the same size.
3. Eye sockets at the side of the head suggest that both are herbivores and need a wide range of sight to notice any carnivores.

Megafauna – Teacher Notes



4. The bumps at the back of the skull are for muscle attachment and suggest both are quadrupeds.

Can we definitively state that both creatures were herbivores and about the same size? **NO. This is just the best interpretation AT THIS TIME WITH THE INFORMATION AVAILABLE.**

How did the megafauna become extinct?

Materials per student or group of three

- Scrap paper
- Internet access and reference books

You may wish to discuss with students how to select reliable sources of information

Scientists have suggested that:

1. Higher levels of oxygen in the atmosphere caused low global atmospheric moisture levels decreasing rainfall and resulting in the loss of their food sources
2. As part of normal climate variation cycles, Australia became drier changing the vegetation from rainforest and soft grasses to hard leaved eucalypts and rough grasses such as spinifex.
3. Megafauna being large were less able to compete with smaller competitive species for their increasingly restricted food sources
4. The drying climate brought an increased frequency of droughts and lightning strikes which resulted in more fires
5. The arrival of Aboriginal people caused them to be hunted to extinction.
6. The use of Aboriginal firestick farming favoured the survival of hardy rough grasses such as spinifex that were a poor food source for megafauna.

Give each group one of the suggestions above and ask them to quickly individually research it. They are to choose two sources that are reliable and make rapid notes.