

Fossils and Climate – Teacher Notes

Most plants and animals are adapted to their environment. For example, animals which live in cold climates tend to have hair or fur to help them keep warm, whilst animals which live in hot climates have little hair or fur to help them cool off more easily. The shapes of trees can also tell us about the environment in which they evolved. Trees in cold climates need to have their branches sloping downward to shed snow, whilst tree branches in hot climates can use upward sloping branches to funnel precious rainwater towards their roots.



What can a leaf tell us about animals nearby?

We can also use fossils to figure things out about other species that lived in the same time and area. For example, we can look at the teeth of an animal to understand what kind of food it ate, or we can look at the available food in a landscape to understand what kinds of animals must have lived there.

Activity 1: Comparing an Australian leaf with a European leaf

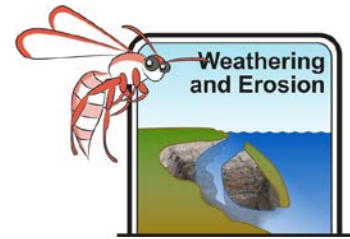
Materials per group or student:

- A leaf from an Australian tree (Any hard-leaved tree like Eucalyptus or Acacia)
- A lettuce leaf or about 10 green grass leaves
- Two paper tissues

Method

1. Examine both leaves and enter your observations in the table below. Fold the lettuce leaf into a small parcel, wrap with tissue and crush in your hand for 30 seconds
2. Repeat using the Eucalyptus leaf in the other tissue
3. Examine and compare the tissues





Fossils and Climate – Teacher Notes

Observations

	European leaf	Australian leaf
Colour	Green	Bluish green or grey
Texture	Soft	Hard
Veins	Very obvious	Less obvious
Ease of crushing	Very easy	Very hard
Moisture and cell fluids released	Much greenish fluid collected in the tissue	Hardly any fluid collected

Discussion

When animals chew leaves, they crush the plant's cell walls and release the nutrients from inside. It is easier to crush the cell walls of a soft leaf than a hard leaf, so a hard leaf releases fewer nutrients than a soft leaf. Which leaf should release nutrients more easily?

The soft (lettuce) leaf releases more nutrients more easily.

If an animal has trouble getting nutrients from its food, would it be a big animal or a small animal?

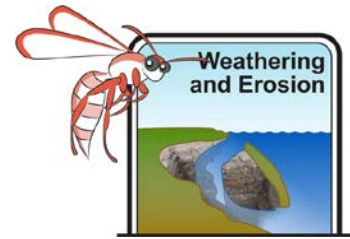
Difficulty getting nutrients would result in a smaller, scrawnier animal. A big animal has plenty of food to eat.

If you found fossils of lots of soft leaves in an area, what might that tell you about the animals that ate those leaves?

The animal species that ate those leaves might have been big.

If you found fossils of some hard leaves in an area, what might that tell you about the animals that ate those leaves?

The animal species that ate those leaves might have been small.



Fossils and Climate – Teacher Notes

Megafauna in Australia

When the glaciers started to retreat at the end of the last Ice Age, huge savannas (grasslands) with plentiful animals appeared across Europe, America, and along the northern shores of Western Australia. Plentiful soft-leaved food meant that animals could grow larger. We find fossils of megafauna from this time period around the world, like mammoths and mastodons (in the Americas) and large cave bears (in Europe). In Australia from this time period, we find fossils of Diprotodons (wombats the size of cows) and Thylacoleo (marsupial lion). These creatures lived in Australia from 2 million years ago to ~46,000 years ago. The Thylacoleo (picture on the right) was similar to the saber-toothed tiger or Smilodon (pictured on the left) found in North America.



What does the size and shape of the teeth of the Smilodon (left) tell you about their diet?
They were almost exclusively meat-eaters, as their chewing teeth are not well developed. They tore apart their prey.

What does their strong muscular body tell you about their lifestyle?
They ran a lot. They chased their prey.

What does their thick, woolly coat tell you about the climate where the Smilodon lived?
It was very cold.

Modern lions, which are about the same size, need to eat between 4.5 and 9kg of meat per day. What does this tell you about the availability of food for Smilodon?
Food was readily available. Some palaeontologists refer to the great grasslands appearing when the ice field melted at this time as a McDonald's for carnivores (meat eaters.)

Fossil evidence from plant pollen shows that the climate was changing rapidly over the last 70,000 years, becoming drier, favouring the growth of hard grasses like spinifex and hard leaved trees like acacia and eucalyptus. Less food means fewer and smaller herbivores (grass eaters) and therefore fewer carnivores.