Reptiles Narrations

Introduction
Because of their unusual and sometimes alien appearance, reptiles have fascinated mankind for many centuries. The name reptile originally comes from the Latin word 'reptum' meaning 'creep'. The study of reptiles is called herpetology, from the greek word 'herpeton' or reptile.

Reptiles include lizards, like this skink, as well as turtles, crocodilians, and snakes. In this ZooGuide you'll learn about the differences between the various groups of reptiles, as well as how reptiles evolved and how they differ from other groups of animals.

Some reptiles like the crocodiles and alligators have been hunted for their skins. Others, like the iguanas, are hunted for food. We all share a responsibility for the conservation of life on our planet, and by learning about reptiles, we hope that you will appreciate the diversity and color that they bring to our planet.

Reptile evolution
Although reptiles are often considered primitive and almost alien in appearance, it is important to remember that these animals represent a vital cornerstone in evolution.

Amphibians were probably derived from fish with stumpy fins that dragged themselves out of the water to spend part of their lives on land. In turn, the reptiles which evolved from the amphibians threw off the shackles that tied their ancestors to water and ventured inland. They gave rise to the huge plant and flesh-eating dinosaurs of the Mesozoic era, animals like Stegosaurus, Triceratops and of course Tyrannosaurus. A hint of things to come came in the form of the feathered dinosaurs like Archaeopteryx.

Mammals did not evolve from reptiles. The two groups both separately evolved from amphibians during the Carboniferous period, some 300 million years ago. Early mammals were related to a group of strange animals called mammal-like reptiles, including the sail-backed Dimetrodon, which lived in the early permian era around 260 million years ago.

Mammal-like reptiles were characterised by their skull shapes which resembled those of the mammals. These mammal-like reptiles became extinct in the early years of the Age of the Dinosaurs.

With the end of the age of the dinosaurs, the reptile domination of the Earth came to an end, although the dinosaur's heritage lives on in the warm-blooded birds, a group of animals more akin to dinosaurs than present day reptiles.

Reptile relatives
The closest relatives to the reptiles are the amphibians - the frogs, toads and salamanders. Amphibians have moist skin and need water to breed: they usually have an aquatic larval stage - like the frog's tadpole - which has to go through the process of metamorphosis to reach the adult form.

Reptiles have acquired a number of modifications which removes this dependence on water. Their dry skin prevents water loss. They lay eggs or give birth to live young, thus avoiding the young animals dependence on water, and finally, reptiles do not have to go through a larval stage - their young resemble the adult when they emerge from the egg.

Reproduction
These chameleons are going through the foreplay behaviors associated with mating. The larger green chameleon is the male, and as he approaches the female he bobs his head. His goal is to subdue the female and capture her front legs so that mating can take place.

After a lengthy chase, the mating itself begins. The male of this species of chameleon is actually quite gentle during the mating process - in other species the male is more aggressive towards the female.

Skin
Reptile skin is hardened and thickened and shows a wide range of adaptation. This lizard skin is bumpy in texture, as is the skin of chameleons. The skin of many species of iguana is formed into a crest along the animal's back.

The skin of the beaded lizards like the Gila monster shows a characteristic bead-like pattern from which these lizards get their name.

In snakes, the scales form a highly flexible body covering, with smaller scales on the snakes upper surface, and larger overlapping scales underneath - these larger scales are used to grip during movement.

Perhaps the strangest skin adaptation is the rattlesnake's rattle - a structure made of interlocking horny segments. A new segment is added each time the rattlesnake moults.

Temperature control
Reptiles have to use their environment to regulate their temperatures throughout each 24 hour cycle. Desert reptiles are usually inactive during the nighttime period when temperatures are low. At sunrise they emerge from their hiding places to bask in the morning sun. As their body temperature increases, the reptiles become active and can forage for food.

During the late morning and afternoon in summer, desert reptiles may return underground to escape the sun's searing heat. In the winter months they may remain active throughout the day. At the end of each day as the air temperature and the reptiles body temperature fall, the reptile returns underground for the night.

Skeleton

Circulation and blood
This lizard heart shows a typical vertebrate circulatory system, with oxygenated blood from the lungs - shown here in red - entering the left atrium and leaving for the body organs via the left ventricle.

The deoxygenated blood returning from the body goes into the right atrium and is then pumped back to the lungs via the right ventricle.

Because the two sides of the ventricle are not completely separated there is some mixing of oxygenated and de-oxygenated blood in the ventricle of reptiles.

In the crocodiles, the separation between left and right ventricle is more pronounced and little mixing occurs.

In mammals the two ventricle halves are completely separated: there is no mixing of the oxygenated and de-oxygenated blood in these so-called higher vertebrates. Studies of the circulatory system of mammals shows that this most advanced system is probably derived from that of the amphibians and not the reptiles, giving evidence that reptiles and mammals evolved separately, and diverged around 300 million years ago.

Nervous system
The reptile brain is divided into a number of different areas, each with its own set of tasks. The brain shown here is that of a rock or wall lizard, and is typical of the brain of many kinds of reptile.

At the front of the brain lie the olfactory nerve and olfactory lobes, the regions responsible for processing smell information. This part of the brain is especially well developed in particular groups of reptiles like the snakes.

Behind the olfactory lobes are the cerebral hemispheres. Much more developed than in the amphibians, the hemispheres are beginning to show the shape and form seen in the birds and mammals.

The pineal body lies between the cerebellum and the optic lobes. Although its main function is to secrete the chemical melatonin important in the regulation of rhythms, the pineal body extends into a rudimentary third eye in the tuatara, a relative of the lizard that lives only in a small group of islands off the coast of New Zealand.

Below the pineal body is the thalamus, an area which integrates sensory input to the brain.

The midbrain of reptiles has two well developed optic lobes - many reptiles have excellent eyesight.

The cerebellum varies in size considerably between reptile groups. It is large in crocodiles and chelonians but small in lizards. The cerebellum is thought to control co-ordination, but as lizards are just as active as turtles the difference in size of the cerebellum between these two groups is difficult to understand.

The infundibulum extends into the medulla, a reflex controlling center for information received from the muscles and joints - it is the part of the brain which attaches to the spinal cord.

Sensory system
This cross section through the head of a Gila monster shows how the lizard is adapted to detect smell. Scent particles are carried to a specialized detector called Jacobson's organ in the roof of the mouth. The scent reaches the organ either through the external nostrils

or by flicks of the tongue.

When the scent particles enter the Jacobsons's organ, they come into contact with sensitive hairs called cilia within the organ. The scent information received by these hairs then travels to the brain through nerves.

Lizards are not the only animals to have Jacobson's organ - the organs are also found in animals as diverse as amphibians, bison and some members of the cat family.

Movement
Although a few fish are able to use their pectoral fins for dragging their bodies out of water, this mode of locomotion is very slow and inefficient.

Life on land requires limbs that can be lifted off the ground. Amphibians have rudimentary legs that drag the body along the ground and only allow fast movement by leaping: true walking requires two right angled bends in the limbs, and this arrangement is first seen in the reptiles.

Although the reptile limb is efficient for rapid movement it does not allow true running. This requires the elbow joint to be straightened out and the limb to be brought in close under the body. Mammals and birds have this arrangement, as well as the extinct dinosaurs.

Venom
Snake venom is made in glands on either side of the head. The venom runs through special grooves in elongated teeth called fangs.

Front fanged snakes like the vipers and rattlesnakes have long hollow fangs which inject poison rather like a hypodermic needle. Rattlesnakes have hinged fangs which fold forwards when the snake is about to strike.

Other front-fanged snakes include the cobras. These have smaller fangs which are fixed in place and do not hinge forwards. The fangs of these snakes are rounded, so that concentrated venom is channelled into the wound that the snake makes when it bites its victim.

Spitting cobras have holes which face forwards at the bottom of their fangs. These snakes can squirt venom at their victims' eyes, blinding the prey temporarily.

Some poisonous snakes have their fangs at the back of the jaws. These back-fanged snakes include the boomslang, a deadly snake that lives in southern Africa. Back-fanged snakes have U-shaped, inefficient fangs that have to work to get sufficient poison into the wound.

Where do reptiles live?
This arid landscape at Palm Desert in the southwestern USA is home to a number of different reptiles, including snakes, lizards and the desert tortoise. The desert environment provides one of the most important raw materials for reptile survival - warmth.

The world's tropical rainforests are also home to numerous reptile species and forest species do not have to cope with the dramatic temperature changes found in the desert.

Deception
When a lizard is grabbed by a predator, its tail often breaks off without harming the body, and the tail later regenerates.

How can lizards do this?

The tail vertebrae of many lizards are incompletely formed into bone. These vertebrae have a special region midway along them. If the tail is seized, the vertebrae separate at one of these breakage points and the animal runs away, leaving the bemused predator with a wriggling tail between its teeth.

Some lizards like the skinks may have brightly colored tails, making sure that this is the part that attracts the predators teeth.

Feeding
Although some reptile groups like the turtles have plant-eating species, the majority of reptiles are meat-eaters, with the smaller species favoring insects and mollusks while larger reptiles eat small mammals and birds.

Some reptiles like the chameleons shown here have become well adapted to hunt for food. The chameleon's tongue catapults out to snare insects on the branches of trees and bushes. The tongue has a sticky tip which sticks to the prey.

Class and order
Reptiles range from slow moving chelonians like this tortoise to fast-moving lizards and snakes. They are grouped into four orders which each have their own characteristics. Some of the distinguishing features of each order are clear - we all know that turtles have a shell, for example, and this is enough to put the turtles and tortoises in their own order.

But sometimes classification can be rather puzzling. Snakes and lizards are grouped together - why? - because although snakes have lost their limbs, they still share many features in common with lizards, for example they have similar skin and vertebrae and a pair of penises called hemipenes.

Suborders and families

Within each order are a number of groupings which can appear confusing to the novice. For example, although snakes, lizards and worm-lizards all look different and are all suborders of the Squamata, the turtles, which on the face of it look similar, are also split into two suborders.

This pond turtle ... and this mata mata ... both look roughly the same - they share fundamental turtle characteristics. However, zoologists think that their differences are great enough to make them belong to different suborders, based mainly on the way the neck folds into the shell.

Turtle anatomy

The shell of the turtle gives a greater degree of protection than almost any other vertebrate armor. Made up of around 60 bones, the turtles shell is made up of two parts: the upper carapace and the lower plastron. The two parts are connected by extensions on each side of the plastron.

This cross section shows that the carapace is made up of fused bones which are in turn attached to the ribs and vertebrae of the turtle.

The outer layer of the shell is made up of large scales called scutes: these are derived from the skin, and they strengthen the bony part of the shell.

Turtles are broadly divided into two groups. Cryptodire or hidden-neck turtles have a neck which bends in a vertical S-shape when retracted. The pelvis of these turtles is not fused to the shell.

Pleurodire or side-necked turtles have a neck which folds sideways under the shell, and their pelvis is fused to the shell.