17D—Class Reptilia: The Reptiles

To many people, reptiles have an unredeemable reputation. The appearance and behavior of these animals have become symbols of the power and subtlety of evil. More than a few students of biology would prefer to ignore them. However, in order to obey God's command to exercise wise and good dominion "over every living thing that moveth upon the earth" (Gen. 1:28), man must study the domain given him by God. And, of course, part of that domain is the world of reptiles. The reptiles, like all animals, reveal something about God. Specifically, they show that even the less appreciated creatures play a role in God's plan. While the serpent is often aligned with temptation or punishment, it also serves as a symbol of God's power (Exod. 4:3) and redemption (Num. 21:8–9). All of creation, which He called "very good," performs His bidding.

17D-1 Objectives

- List and describe major characteristics of the class Reptilia
- Describe and give the functions of each part of the amniotic egg
- Compare the different styles of reptilian hearts with the amphibian heart
- Give evidence to support the argument that man and dinosaurs coexisted

17D.1
Some snakes shed their skin many times each year.

17D.2
Reptiles' scales are specially designed to help absorb solar energy.

17D-1 Characteristics of Reptiles

Although many amphibians are terrestrial, most of them must stay in moist environments. The amphibian's thin skin must be periodically moistened, and amphibian eggs must be deposited in a wet area to develop. The members of the **class Reptilia**, however, have a special protective skin, possess lungs from birth, and lay eggs encased in shells. These features make many reptiles well suited for life on land. All reptiles must breathe air; therefore, even marine reptiles, such as certain turtles and sea snakes, can drown.

One characteristic most reptiles share with amphibians is a three-chambered heart. Three-chambered reptile hearts have a partially divided ventricle that helps to keep oxygenated and deoxygenated blood from mixing. Some reptiles (alligators and crocodiles) have a four-chambered heart similar to that of mammals and birds. Reptiles, if they have limbs, have claws on their toes, a characteristic not shared by the amphibians.

Skin

Snakes and lizards are often called "slimy," an inaccurate description. Their skin is better described as cool, dry, or leathery. The scales, which give the reptile's body this texture, are part of a thick skin with few glands. Scales are composed mainly of keratin, a fibrous protein that is waterproof and quite durable.

Generally, reptilian scales are nonliving and cannot grow with the animal. The reptile must periodically shed, or molt, its outgrown scales and replace them with a larger set, which the reptile grows before it sheds the old. Unlike amphibian skin, which is thin and moist to permit respiration, reptilian skin and scales are thick and dry to prevent water loss. Since many reptiles live where water is scarce, this water-preserving function is essential to the animal's survival.

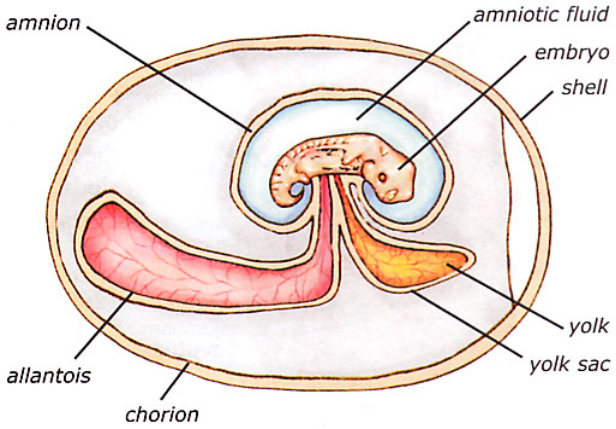
The thick skin of a reptile helps it conserve some heat in its body. Reptiles are predominantly ectothermic. Many reptiles do "sun themselves" to warm their bodies, but too much heat can kill them. Most reptiles therefore hide in cool spots during the hot part of the day. In cool weather many reptiles hide and enter an inactive state similar to hibernation.

Amniotic Egg

Reptilian eggs differ from those of water-breeders such as fish and amphibians. In water, small eggs covered with a gelatin-like material develop without difficulty; on land, such eggs would quickly dry up and die. The reptile must, therefore, have an egg that maintains a suitably moist environment for the developing animal. The **amniotic** (AM nee AHT ik) **egg**, which is produced by all egg-laying reptiles, meets this condition.

Four embryonic membranes form during development within the amniotic egg. The first membrane, the **amnion** (AM nee ahn), grows around the embryo, protecting it in a fluid-filled sac. The second membrane is the **yolk sac**, which surrounds the yolk. The yolk serves as a food source for the developing embryo. The **chorion*** (KOHR ee AHN) is a membrane that lines the inner surface of the shell. The fourth membrane, the **allantois** (uh LAN to hiss), is a sac richly supplied with blood vessels from the embryo. Respiration and elimination of wastes occur through the vessels of this membrane.

The embryo in an amniotic egg is an independent, self-sustaining unit provided with a protective home, a moist environment, and a built-in food supply. All turtles, crocodiles, and alligators lay amniotic eggs. Some lizards and snakes give birth to live offspring. Others retain the eggs inside the body cavity until the young hatch and crawl out. The empty eggs are then expelled.



17D.3
The amniotic egg

Unlike birds, reptiles provide little or no care for their offspring beyond laying the eggs in a suitable spot for development. In fact, most reptiles probably never even see their parents. Rare exceptions include most crocodiles and alligators, which may carry the new hatchlings to the water and protect them for a limited period of time. A few types of lizards also exhibit this protective behavior.

17D.4
The crocodile shown here is carrying one of her babies to water—not eating it.

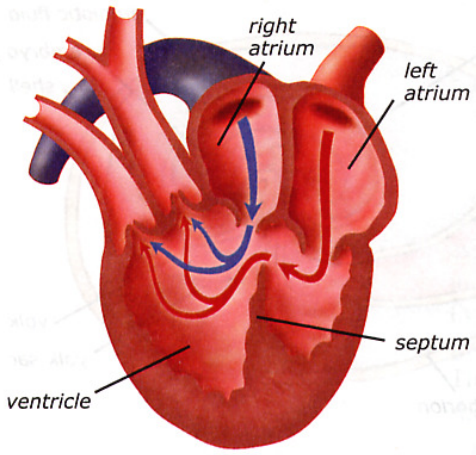
Respiration

Reptiles never use gills for respiration but rely on lungs from the time of birth. Their lungs include many thin air-filled sacs called **alveoli** (*sing.* alveolus) that give them more surface area for gas exchange than is found in amphibian lungs. Even aquatic reptiles like sea turtles respire with lungs, but they are very efficient at holding their breath for long periods. Most reptiles draw air into their lungs by expanding the rib cage.

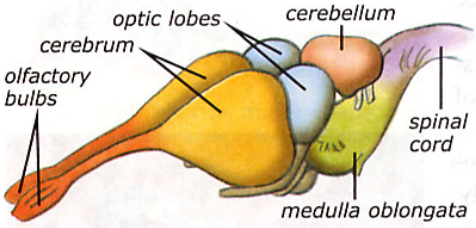
Circulation

Like the amphibians, most reptiles have a three-chambered heart with two atria and one ventricle. The major difference is that the ventricle is partially divided by a septum (wall) that keeps the oxygenated and deoxygenated blood somewhat separate. In fact, 60%–90% of the blood stays separate as it leaves the heart to go out either to the lungs or to the other tissues that need oxygen. During periods of activity, the movement of this septum may even completely isolate the two circulations, keeping the blood unmixed.

chorion: (Gk. KHORION, afterbirth)



17D.5
Reptilian heart



17D.6
Reptilian brain

Crocodiles and alligators have a four-chambered heart with a structure similar to the heart of birds, mammals, and humans. To conserve energy, crocodiles have a special cog-style valve in their heart that can prevent blood from being pumped to the lungs, pumping it instead to the rest of the body. This may explain how they can stay submerged for such long periods. Crocodiles also have the ability to slow their heartbeat to one to two beats per minute.

Nervous System

Reptilian brains usually amount to less than 1% of their total body mass, and a crocodile's is less than 0.5%. The brain does not fill the cranium (brain case) as it does in birds, mammals, and humans, and it is sometimes not even totally surrounded by bone. Despite these seeming disadvantages, reptiles have many highly acute senses.

The cerebrum, the lobe associated with controlling and coordinating behavior, is much larger than in fish or amphibians. Because most reptiles have fairly large eyes and vision is important, they have large optic lobes. Most reptiles, with the exception of snakes, have a tympanum or eardrum, often inside a canal. It is connected to an inner ear that processes sound waves.

One of the most important sensory organs for all snakes and many lizards is a pair of **Jacobson's organs**. These pits in the roof of the mouth contain nerve endings sensitive to chemicals captured from the air by the animal's tongue. This sense can help these reptiles find prey, locate mates, and even avoid predators.