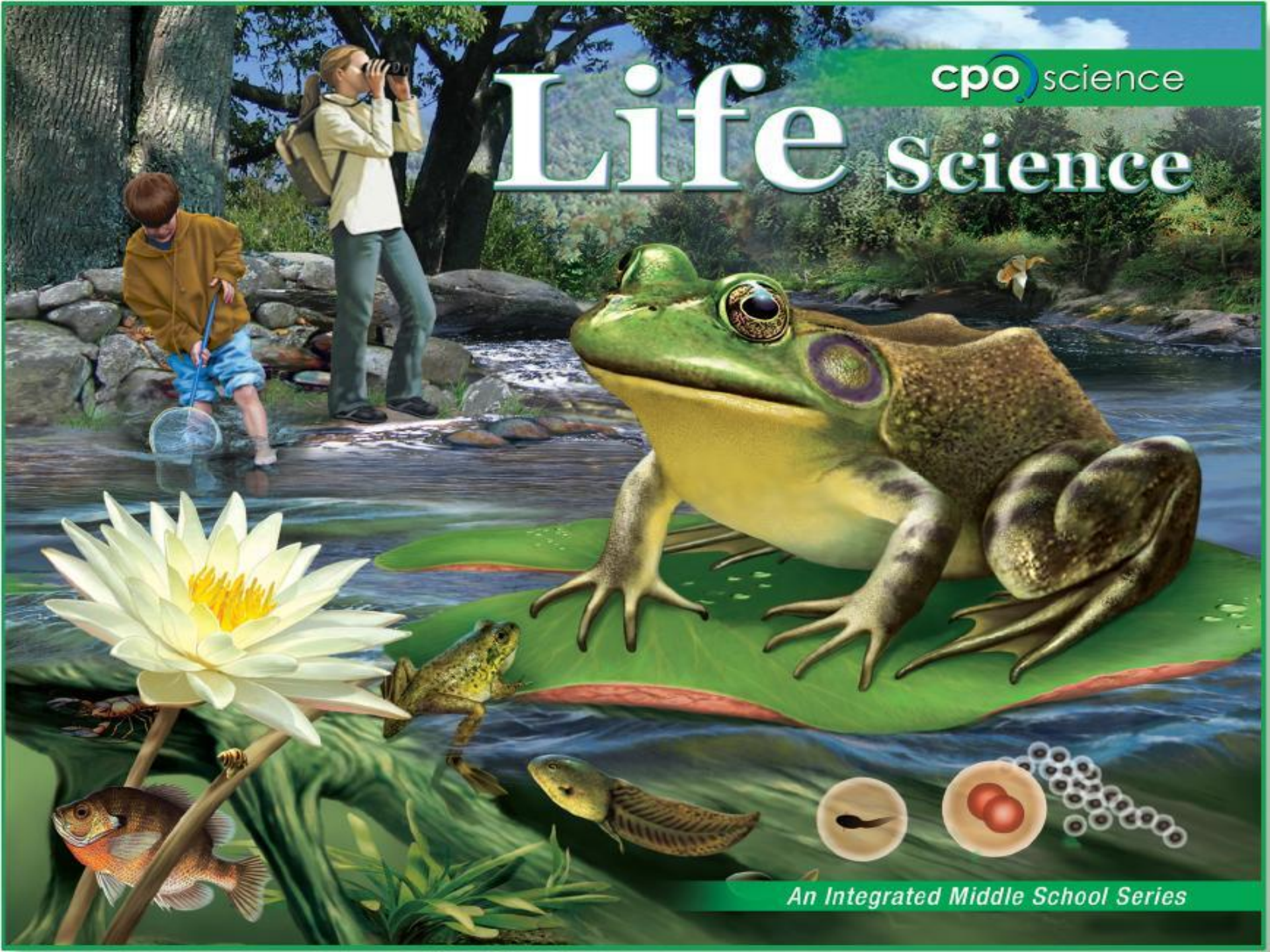

cpo science
Life Science
An Integrated Middle School Series

Structure and Function in Living Things

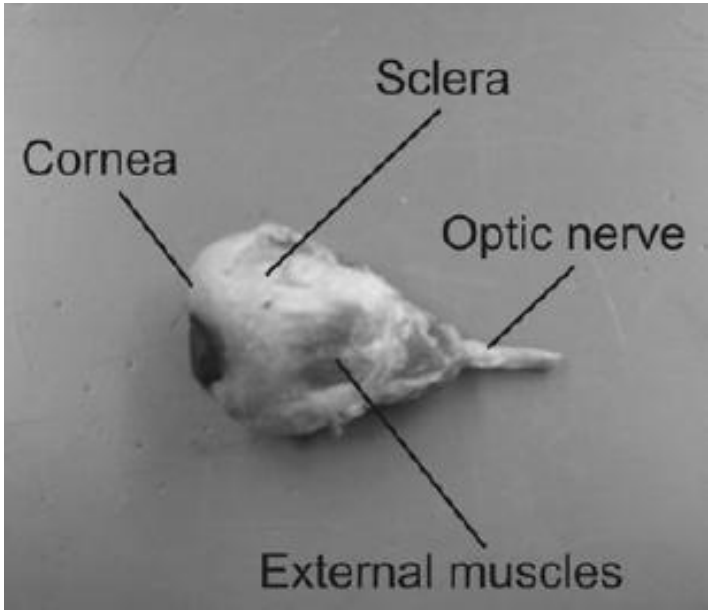
Chapter Seventeen: Animals

- **17.1 What is an Animal?**
- **17.2 Invertebrate Structure and Function**
- **17.3 Vertebrate Structure and Function**

Investigation 17B

The Mammalian Eye

- *What are the structures of the mammalian eye and how do they function?*



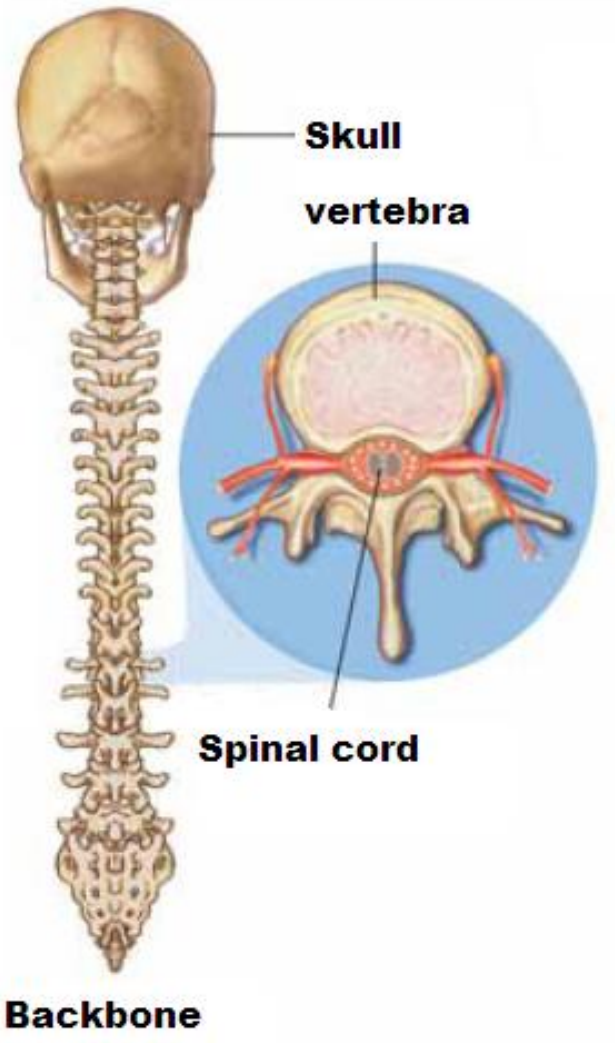
17.3 Vertebrate structure and function

An embryos of sea squirts have notochords like humans embryos.

- Humans and sea squirts are members of the *Phylum Chordata* (called *chordates*).
- All chordates have a structure called a notochord.
- A **notochord** is a flexible, rod-shaped structure found in the embryos of all chordates.

17.3 Characteristics of vertebrates

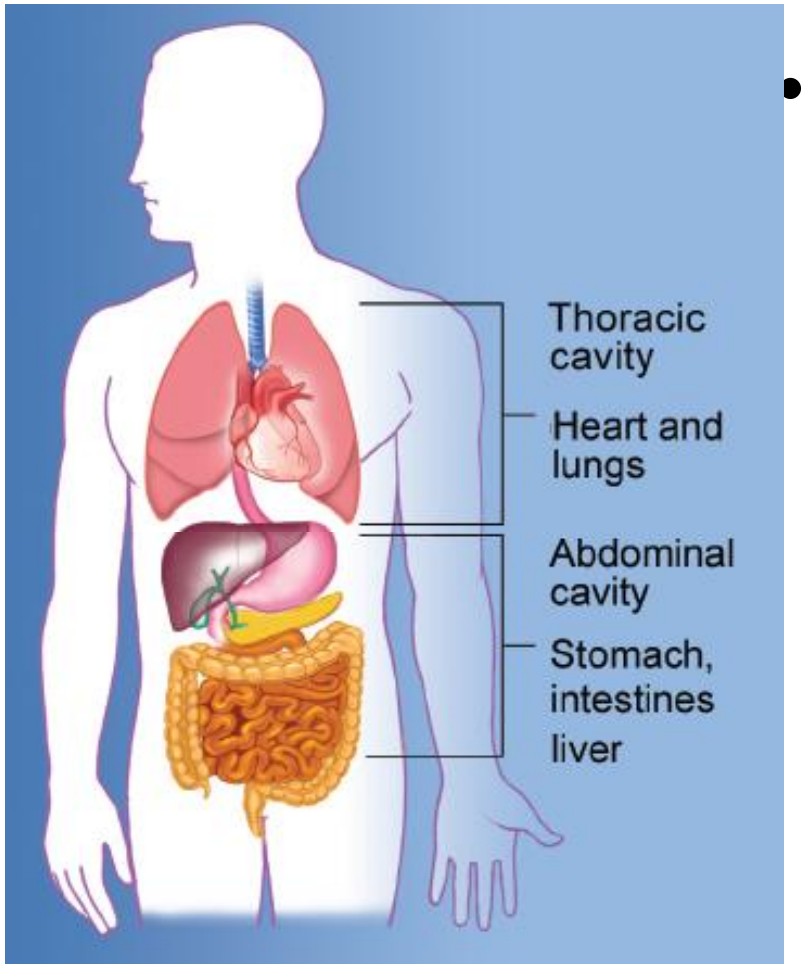
- All vertebrates have a **backbone** and a **skull.**
- The backbone is a segmented column of interlocking bones called **vertebrae**.



17.3 Characteristics of vertebrates

- All vertebrates have an internal **skeleton** for support, protection, and a place for muscles to be attached.
- The bones and muscles of vertebrates work together to provide a structural framework for movement.

17.3 Vertebrate structure and function



- All vertebrates have a body cavity that holds the organ systems.
  - The **thoracic cavity** holds the heart and the lungs of air-breathing vertebrates.
  - The **abdominal cavity** holds the digestive organs including the stomach, intestines, and liver.

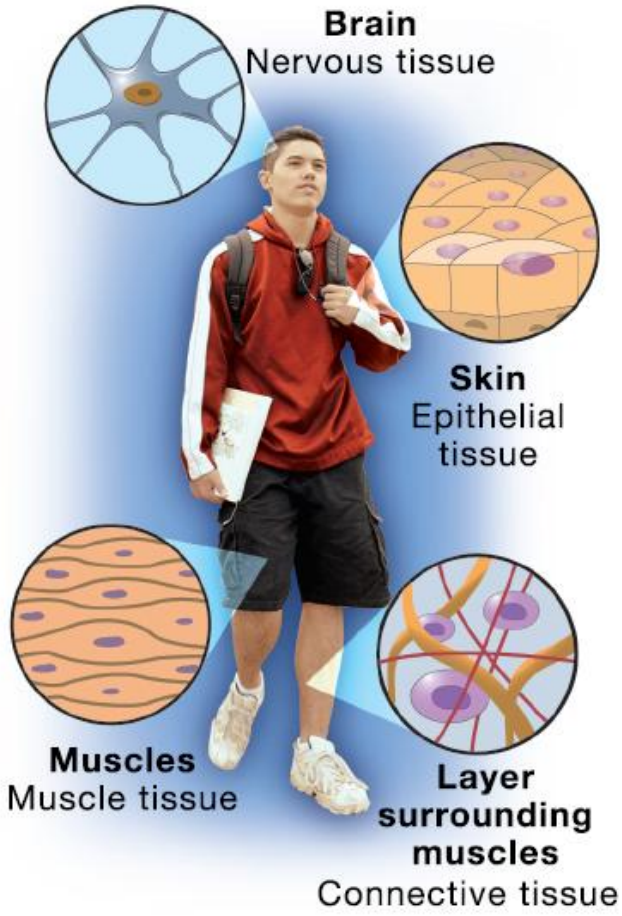
17.3 Characteristics of vertebrates

- Vertebrates have well-developed organ systems.

Organ system	Main function	Major organs
Integumentary	Barrier to external environment	Skin, scales, feathers, fur
Skeletal	Support and movement	Bones, cartilage
Muscular	Movement	Muscles, tendons
Digestive	Take in and digest food	Stomach, intestines, liver, pancreas
Respiratory	Exchange of oxygen and carbon dioxide	Lungs or gills
Circulatory	Transport materials to cells	Heart, blood vessels
Reproductive	Produce offspring	Testes, ovaries
Nervous	Response and movement	Brain, nerves
Urinary	Clean wastes from the blood	Kidneys
Endocrine	Regulate body functions	Glands that produce hormones

17.3 Vertebrate organs are made of four types of tissues

- An **organ** is a group of tissues that function together.
- Vertebrate organs are made of four types of tissues:
  - nervous
  - epithelial
  - connective
  - muscle



17.3 Other characteristics of vertebrates

- Vertebrates reproduce sexually and have separate male and female individuals.
- Fertilization in vertebrates may occur externally or internally.
- In **external fertilization**, the female lays eggs and the male drops sperm onto them.
- In **internal fertilization**, the male deposits sperm inside of the female.

17.3 Other characteristics of vertebrates

- Most animals need to keep their bodies at a certain temperature so the chemical reactions inside their cells proceed.
  - Animals that are not able to control their body temperature are called **ectotherms**.
  - **Endotherms** such as birds and mammals use the heat produced by the chemical reactions in their cells to maintain aconstant body temperature.

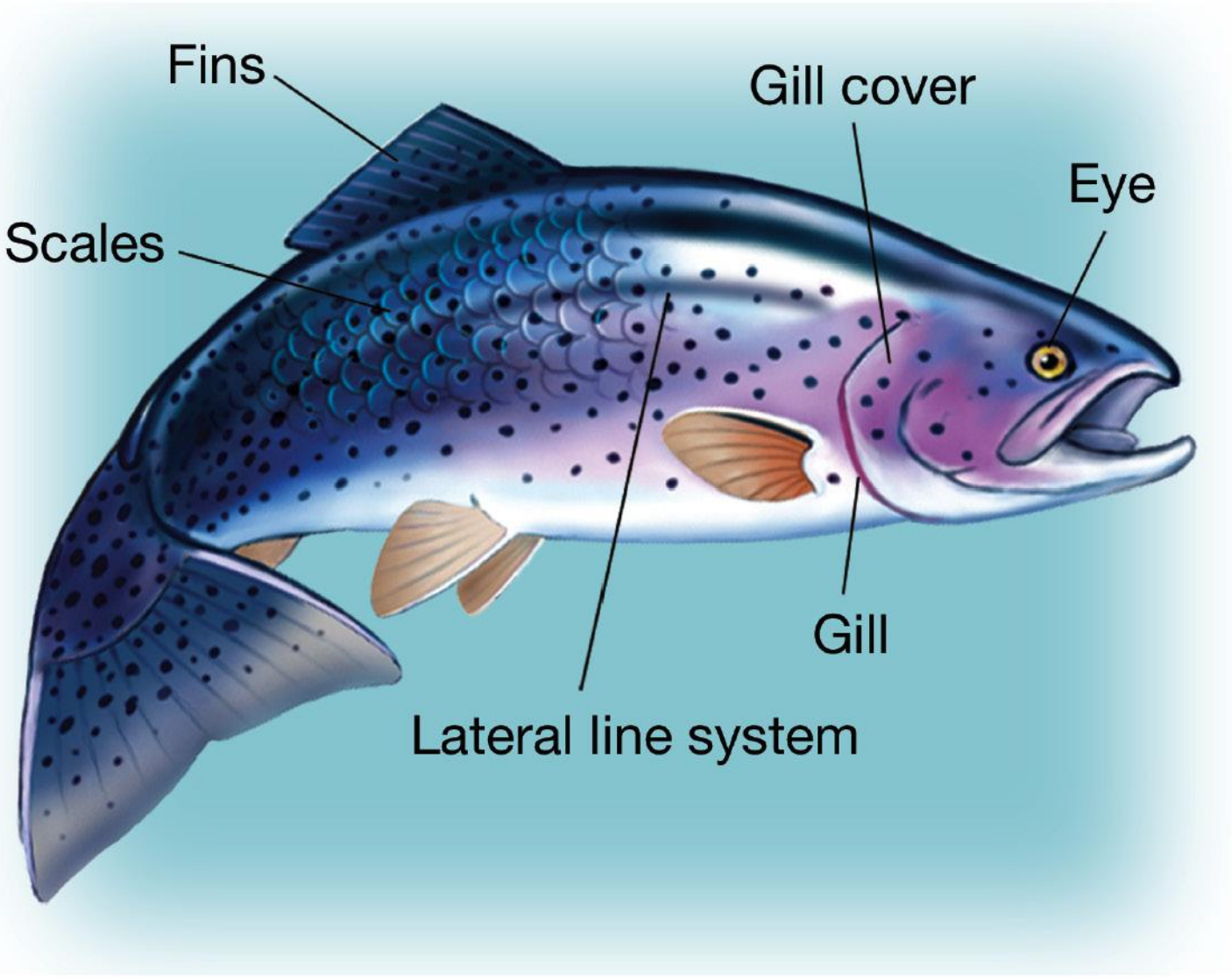
17.3 Fish

- **Fish** are ectothermic, aquatic vertebrates with fins, gills, and a streamlined body.
- They were the first vertebrates, and evolved about 500 million years ago.

17.3 Fish

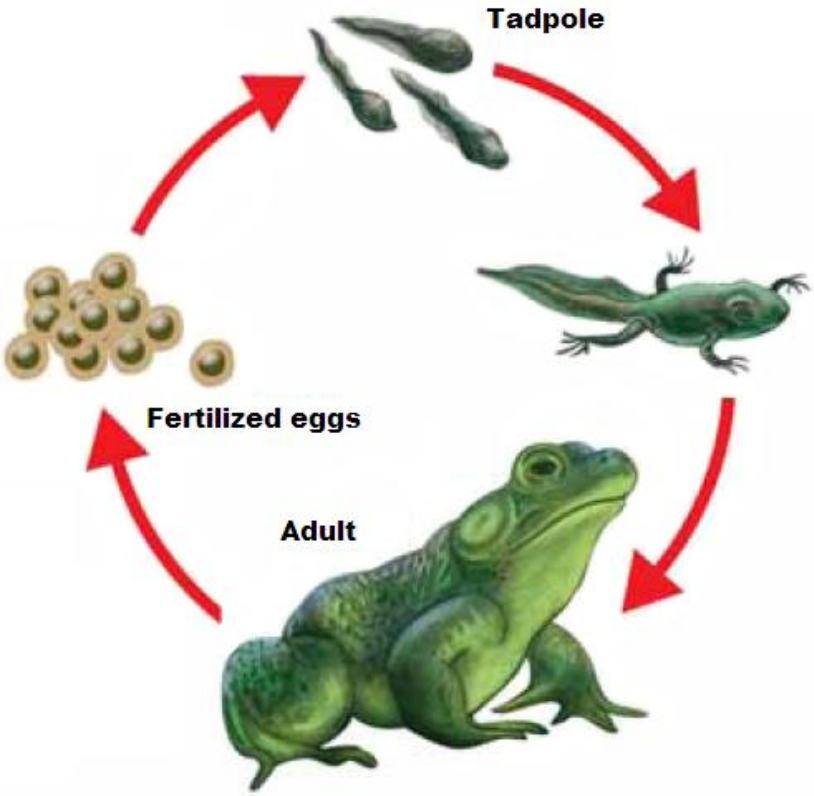
- There are three classes of fish living today.
  - *jawless fish*
  - *cartilagenous fish*
  - *bony fish*

Fish Anatomy



17.3 Amphibians

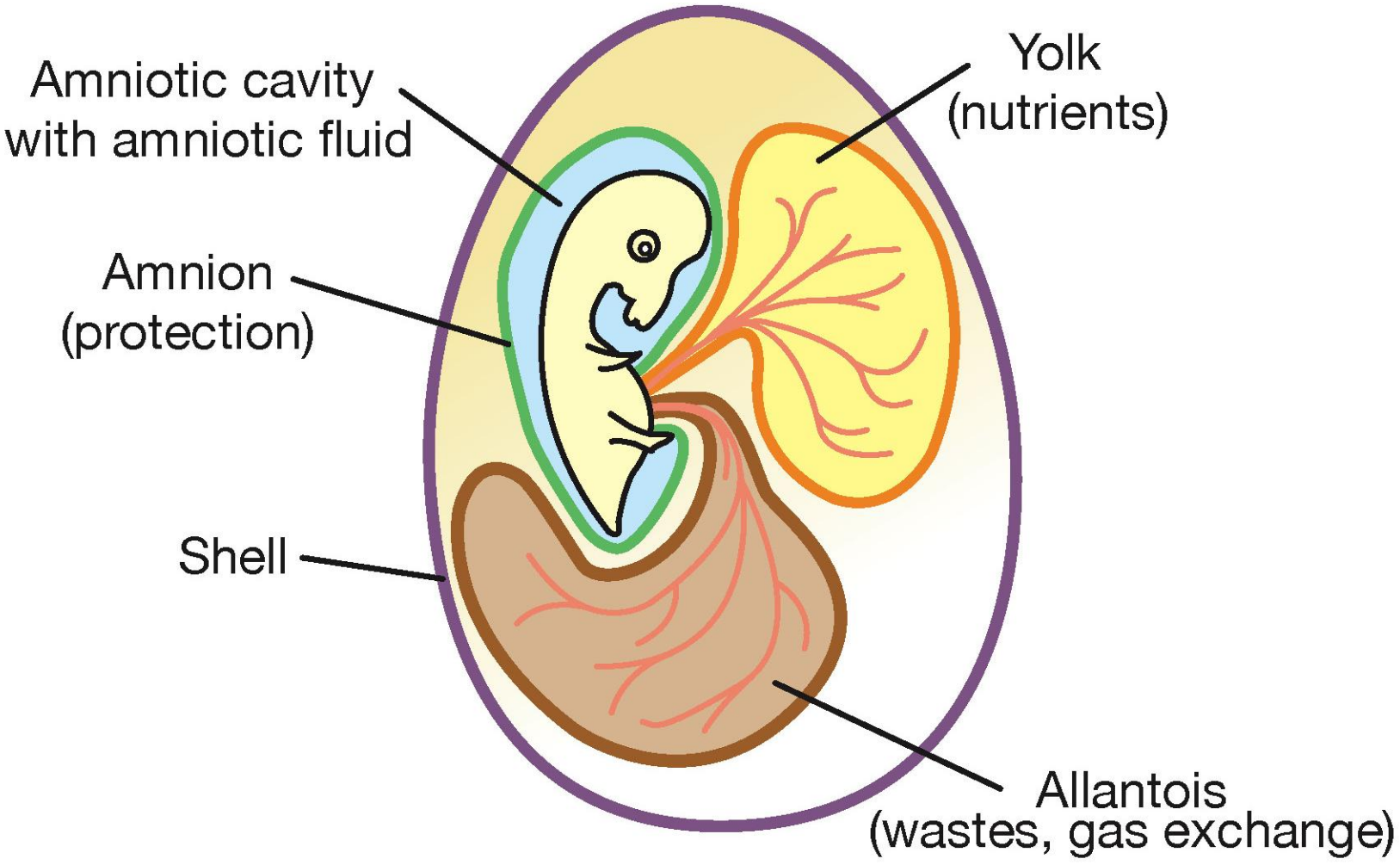
- **Amphibians** are ectothermic, smooth-skinned vertebrates, such as frogs and salamanders, that usually hatch as an aquatic larva with gills.



17.3 Reptiles

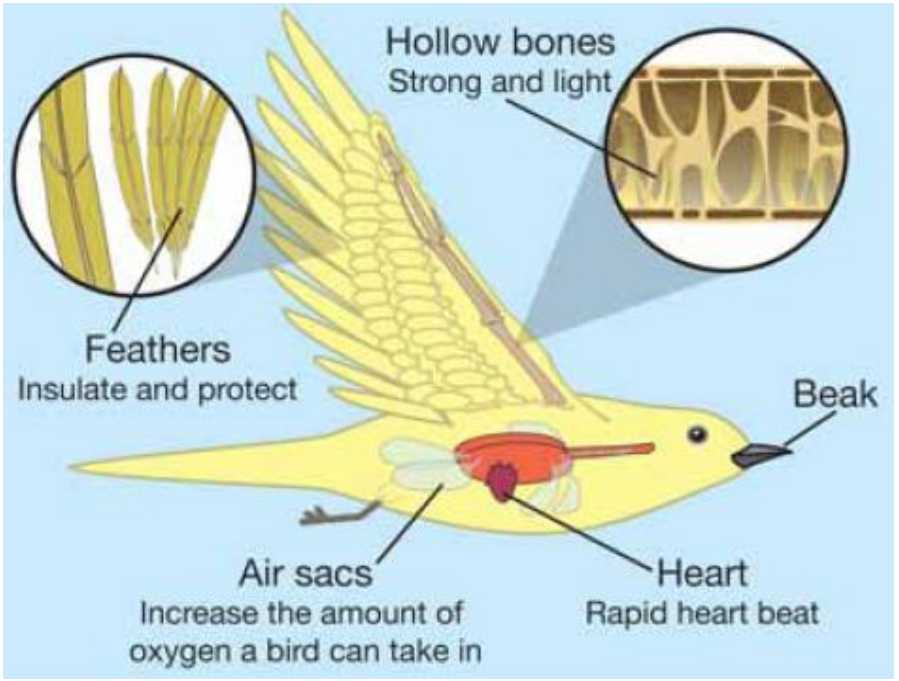
- Reptiles are ectothermic, egg-laying vertebrates, that have an external covering of scales and breathe with lungs.
- The most important adaptation for life on land was the amniotic egg.
- An **amniotic egg** is surrounded by a shell that protects it from drying out.

Egg Structure



17.3 Birds

- Birds are endothermic, egg-laying vertebrates with forelimbs modified to form wings.
- They have many adaptations for flight such as feathers, wings, hollow bones, and air sacs.



17.3 Mammals

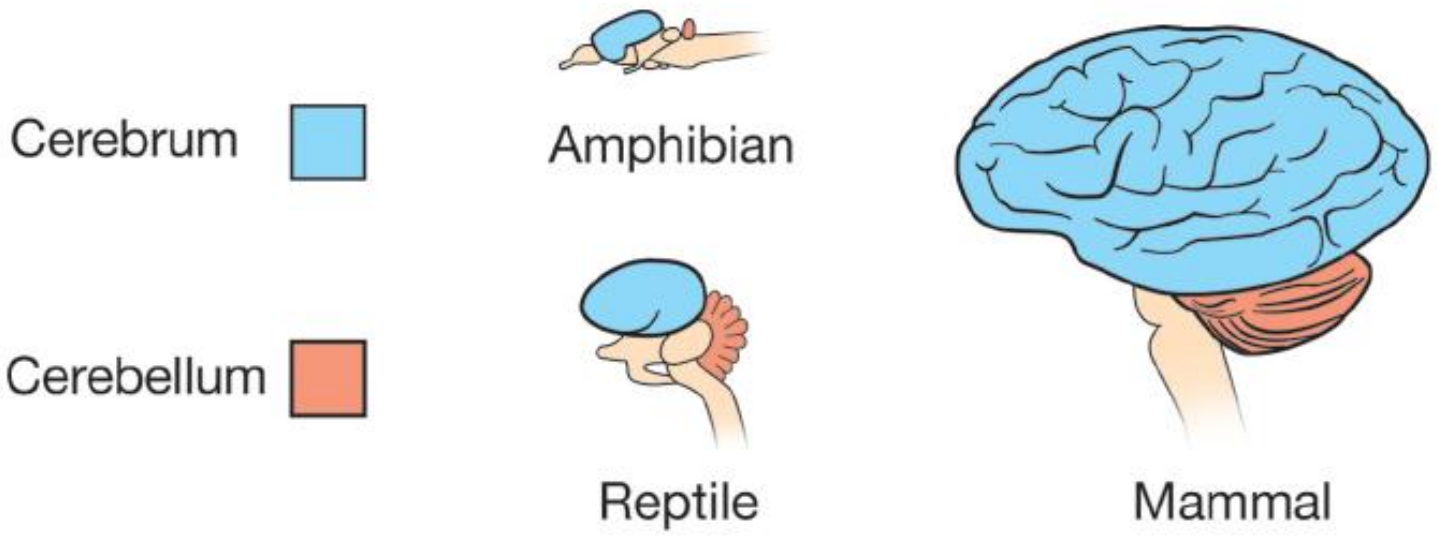
- Mammals are endothermic vertebrates that have mammary glands.
- **Mammary glands** are organs that produce a nutritious fluid called milk.

17.3 Mammals

- Mammals evolved from a now-extinct group of reptiles called **therapsids**.
- The earliest true mammals appeared over 200 million years ago.

17.3 The mammalian brain

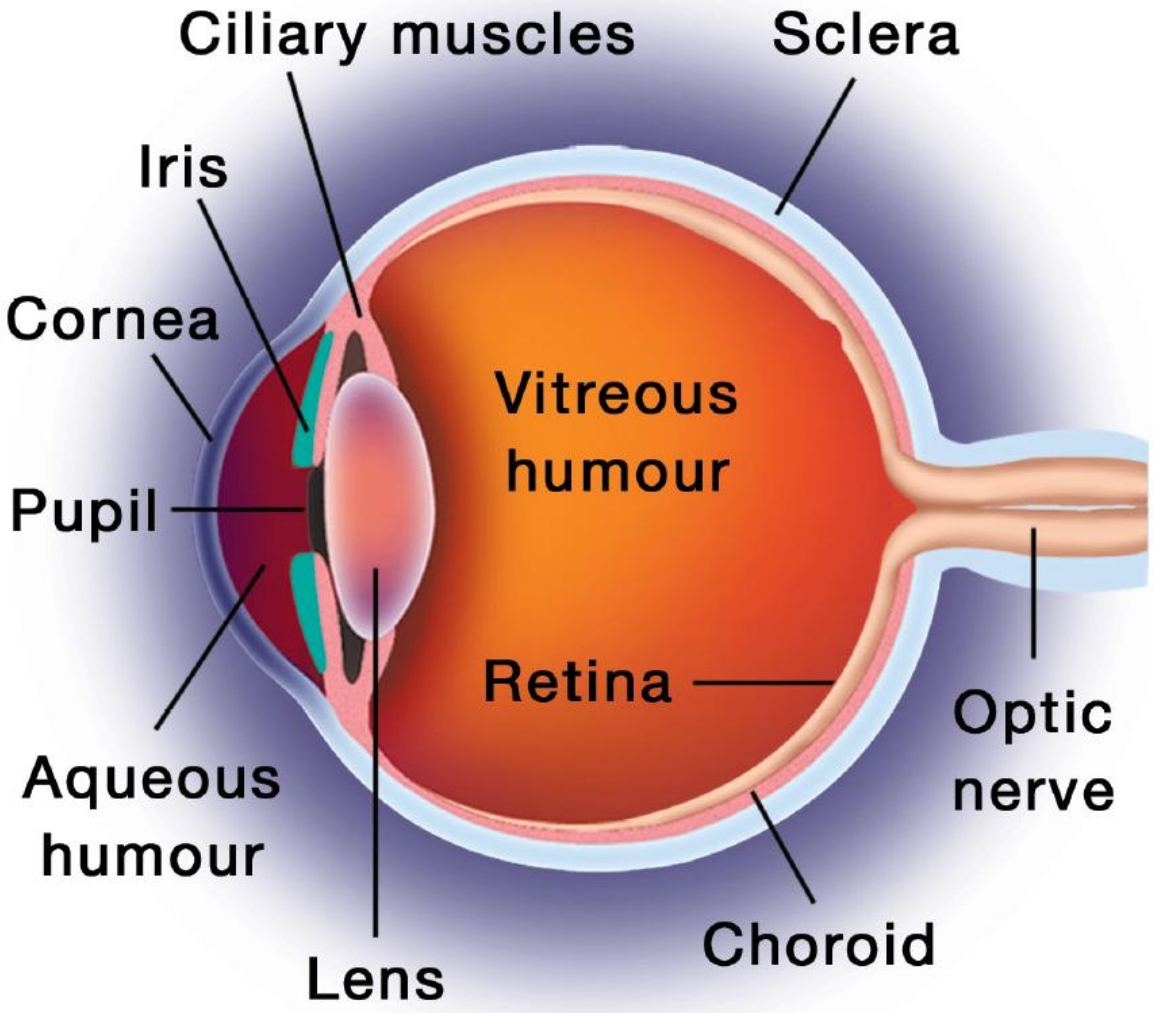
- The brain of a mammal is more developed than that of other vertebrates.
- Mammals have a larger cerebrum and cerebellum than other animals such as amphibians or reptiles.



17.3 The mammalian eye

- Vision is an important way mammals perceive their environment.
- The **lens** is a transparent structure that, along with the **cornea**, refracts and focuses light.
- The **pupil** is a hole in the iris that controls the amount of light entering the eye.
- The **iris** is the pigmented part of the eye.

Eye Structure



Research Connection

Snails vs. Crabs- An Undersea Arms Race

- Dr. Geerat thinks that some variations in shells may be linked to the different types of predators faced by snails in different areas.

Activity

Make an Evolutionary Tree

- In this activity, you will create an evolutionary tree showing evolutionary relationships among vertebrates and their ancestors.