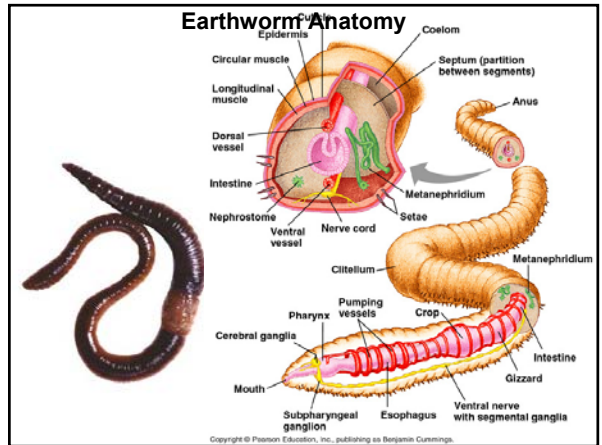


Table 33.4 Classes of Phylum Annelida	
Class and Examples	Main Characteristics
Oligochaeta (terrestrial and freshwater segmented worms; e.g., earthworms) (see FIGURES 33.23 and 33.24a)	Reduced head; no parapodia, but setae present
Polychaeta (mostly marine segmented worms) (see FIGURE 33.24b and c)	Well-developed head; each segment usually has parapodia with setae; tube-dwelling and free-living
Hirudinea (leeches) (see FIGURE 33.24d)	Body usually flattened, with reduced coelom and segmentation; setae absent; suckers at anterior and posterior ends; parasites, predators, and scavengers



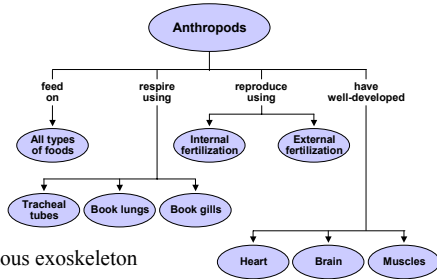
Comparing Flatworms, Roundworms, and Annelids			
CHARACTERISTIC	FLATWORMS	ROUNDWORMS	ANNELIDS
Shape	Flattened	Cylindrical with tapering ends	Cylindrical with tapering ends
Segmentation	No	No	Yes
Body cavity	Acoelomate	Pseudocoelomate	Coelomate
Digestion and excretion	Gastrovascular cavity with one opening only; flame cells remove metabolic wastes	Tube-within-a-tube digestive tract, opening at each end; metabolic wastes excreted through body wall	Tube-within-a-tube digestive tract, opening at each end; nephridia remove metabolic wastes
Respiration	Through skin; no respiratory organs	Through skin; no respiratory organs	Through skin; aquatic annelids breathe through gills

# Arthropods

## 4 Major Subphyla

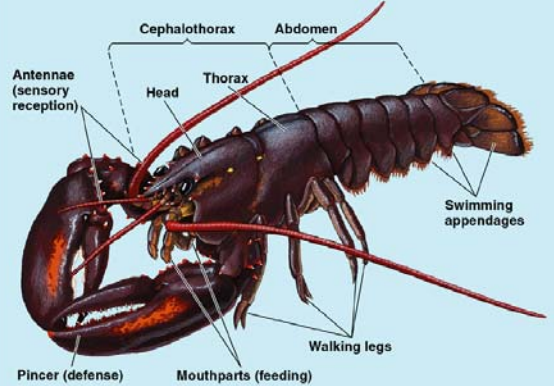
- **Trilobites**
  - dwellers in ancient seas
- **Chelicerates**
  - spiders
  - ticks
  - mites
  - scorpions
  - horseshoe crabs
- **Crustaceans**
  - crabs
  - shrimp
- **Uniramians**
  - centipedes,
  - millipedes
  - all insects
    - including bees, moths, grasshoppers, flies, and beetles.

## Diversity



- Chitinous exoskeleton
- Jointed appendages
- Segmented body

## External anatomy of an arthropod



**Table 33.5 Some Major Arthropod Classes (based on a traditional taxonomy that places all arthropods in a single phylum, Arthropoda)**

Class and Examples	Main Characteristics
Arachnida (spiders, scorpions, ticks, mites)	Body having one or two main parts; six pairs of appendages (chelicerae, pedipalps, and four pairs of walking legs); mostly terrestrial
Diptopoda (millipedes)	Body with distinct head bearing antennae and chewing mouthparts; segmented body with two pairs of walking legs per segment; terrestrial; herbivorous
Chilopoda (centipedes)	Body with distinct head bearing large antennae and three pairs of mouthparts; appendages of first body segment modified as poison claws; trunk segments bear one pair of walking legs each; terrestrial; carnivorous
Insecta (insects)	Body divided into head, thorax, and abdomen; antennae present; mouthparts modified for chewing, sucking, or lapping; usually with two pairs of wings and three pairs of legs; mostly terrestrial
Crustacea (crabs, lobsters, crayfish, shrimp)	Body of two or three parts; antennae present; chewing mouthparts; three or more pairs of legs; mostly marine

Figure 33.27 A trilobite fossil



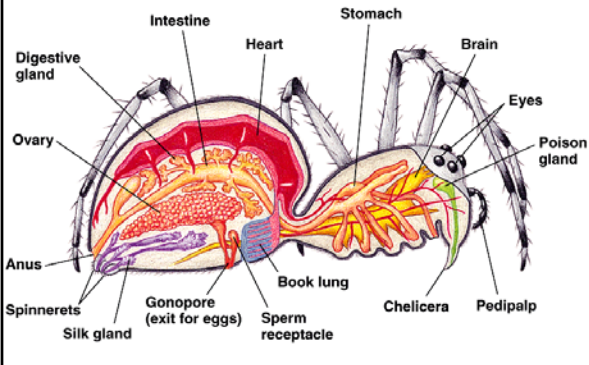
Horseshoe crabs, *Limulus polyphemus*



**Arachnids:** Scorpion (left), honeybee air tube filled with parasitic



Spider anatomy



(b) Anatomy of a spider  
Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

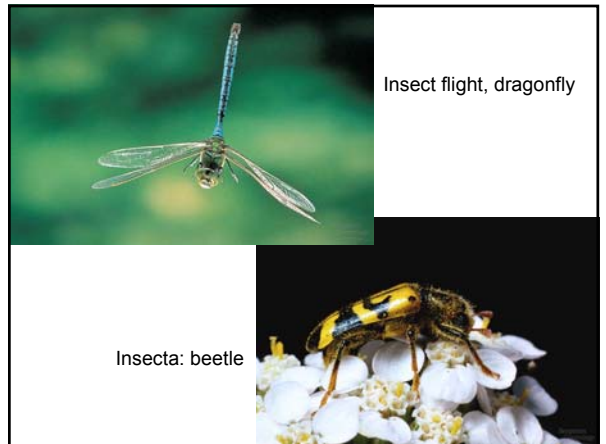
Lycosid spider: female with offspring



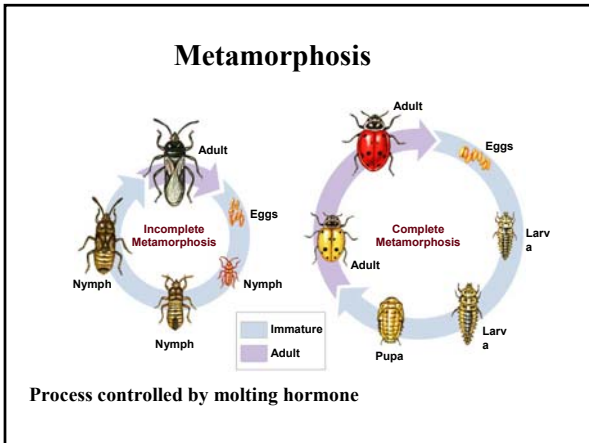
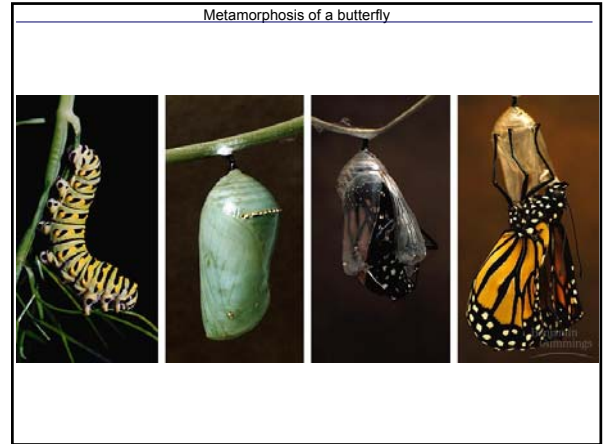
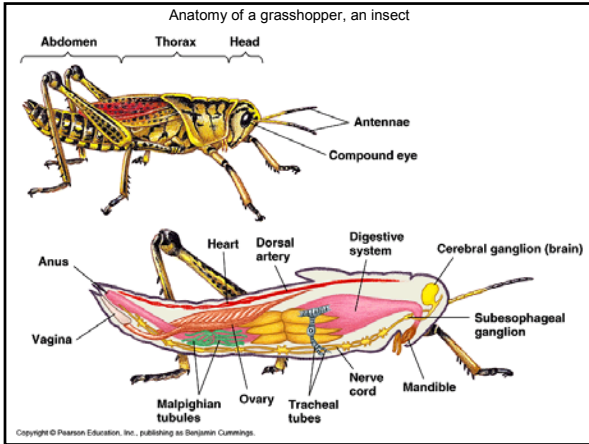
Class Diplopoda (millipedes)



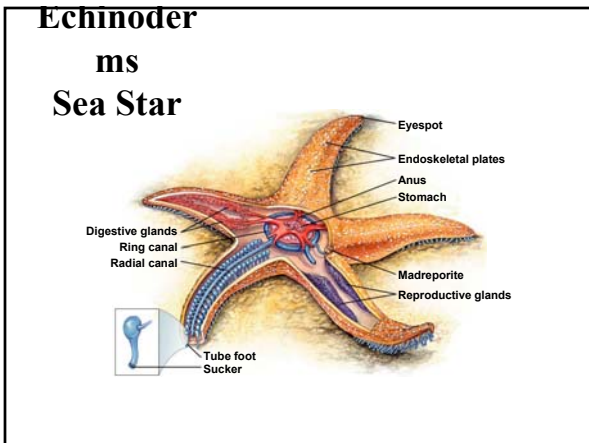
Insect flight, dragonfly



Insecta: beetle



- The Deuterostomes**
- Echinoderms
  - Chordates
    - “mouth second”
    - Spiral cleavage
    - Blastopore forms the anus
    - Indeterminate cleavage



Comparing Groups and Major Characteristics of Echinoderms					
Characteristic	Sea urchins and sand dollars	Brittle stars	Sea cucumbers	Sea stars	Sea lilies and feather stars
Feeding	Detritivores	Detritivores	Detritivores	Most carnivores	Herbivores
Shape	Disc- or globe-shaped, no arms	Star-shaped, arms	Cucumber-shaped, no arms	Star-shaped, arms	Stalk with feathery arms
Movement	Burrow in sandy ocean bottom or wedge in rock crevices using moveable spines attached to endoskeleton	Move rapidly along ocean floor using arms	Move slowly along ocean floor using muscular body wall to crawl	Creep slowly along ocean floor using arms	Cannot move; attached to ocean bottom