

Introduction to the Arthropods

Chapter 28: Section 28-1

Page 715

Arthropods are the most diverse and successful animals of all time.

At least three quarters of a million species have been identified - more than three times the number of all other animal species combined.

They include insects, crabs, centipedes and spiders.

Arthropods have a segmented body, a tough exoskeleton and jointed appendages.

The exoskeleton protects and supports the body. It is made from chitin. It varies greatly in size, shape and toughness.

~~X~~ caterpillars -> firm and leathery
lobsters -> so tough and hard it is difficult to crush by hand

Exoskeletons of many terrestrial species have a waxy covering that helps the loss of water.

Appendages are structures that extend from the body wall. Jointed appendages are so distinctive of arthropods that the phylum is named for them:

~~X~~ *arthron* means "joint" in Greek and *podos* means "foot"

Appendages include antennae, claws, walking legs, wings, flippers, mouthparts, tails and other specialized features.

Evolution of Arthropods

Page 716

The evolution of arthropods, by natural selection and other processes, has led to fewer body segments and highly specialized appendages for feeding, movement and other functions.

natural selection: process by which individuals that are better suited to their environment survive and reproduce most successfully

Form and Function in Arthropods

(Page 716)

Feeding

Arthropods include herbivores, carnivores, omnivores and detritivores.

detritivore - organism that feeds on plant and animal remains and other dead matter

There are arthropod bloodsuckers, filter feeders (feed by straining food particles from water) and parasites.



mosquito



krill



tick

Arthropod mouthparts have evolved in ways that enable different species to eat almost any food you can imagine.

Respiration✓

Most terrestrial arthropods breathe through a network of branching tracheal tubes that extend throughout the body. Air enters and leaves the tracheal tubes through spiracles, small opening along the side of the body.

Other terrestrial arthropods like spiders use book lungs, layers of respiratory tissue stacked like the pages of a book.

Most aquatic arthropods (lobsters and crabs) respire through featherlike gills. Horseshoe crabs respire through book gills.

refer back
to notes

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Circulation ✓

Arthropods have an open circulatory system. Blood leaves the blood vessels and collects in a large sinus surrounding the heart. From there, it re-enters the heart and gets pumped through the body again.

Excretion ✓

Most terrestrial arthropods such as insects and spiders dispose of nitrogenous wastes using Malpighian tubules - saclike organs that extract wastes from the blood and add them to feces that move through the gut.

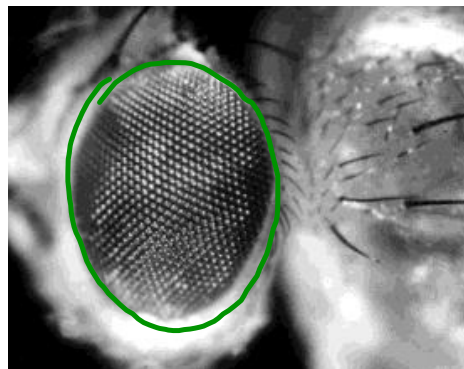
In aquatic arthropods, diffusion moves cellular waste from the body into the surrounding water.]

Response ✓

Most arthropods have a well-developed nervous system.

All have brains. Two nerves that encircle the esophagus connect the brain to a ventral nerve cord. Along the nerve cord are several ganglia. They coordinate the movements of individual legs and wings.

Most have sophisticated sense organs such as compound eyes that may have more than 2000 separate lenses that can detect color and motion very well.



Movement ✓

Arthropods move using well-developed groups of muscles that are coordinated and controlled by the nervous system. Muscles are made up of individual cells. At each joint, different muscles either flex (bend) or extend (straighten) the joint.

Page 718

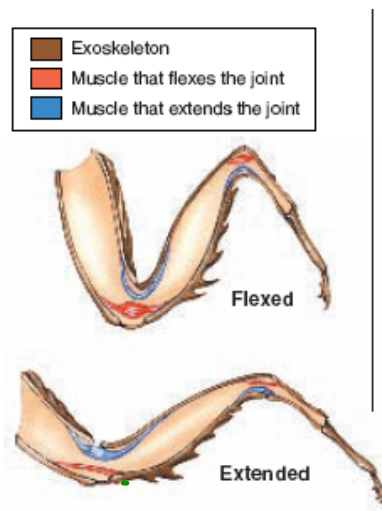


Fig 28-5

▲ **Figure 28-5** This diagrammatic representation shows how muscles attached to the exoskeleton bend and straighten the joints. (Actual muscles are much larger than those shown here.)

The pull of muscles against the exoskeleton allows arthropods to beat their wings against the air to fly, push their legs against the ground to walk or beat their flippers against the water to swim.

Reproduction ✓

Terrestrial arthropods have internal fertilization. }

Aquatic arthropods may have internal or external fertilization. }

Growth and Development ✓

When arthropods outgrow their exoskeletons, they undergo periods of molting. During molting, an arthropod sheds its entire exoskeleton and manufactures a larger one to take its place. }



▲ Figure 28-6 When they become too large for their exoskeletons, arthropods undergo periods of molting. This cicada has just molted and is climbing out of its old exoskeleton.

Page 719

Skin glands digest the inner part of the exoskeleton and other glands secrete a new exoskeleton. When the new skeleton is ready, the animal pulls itself out of what remains of the original skeleton. The process can take several hours. While the new exoskeleton is still soft, the animal fills with air or fluids to allow room for growth before the next molting. Most arthropods molt several times between hatching and adulthood. The arthropods are vulnerable to predators during this process. Animals typically hide during molting or molt at night.

Molting - Horseshoe Crab

