

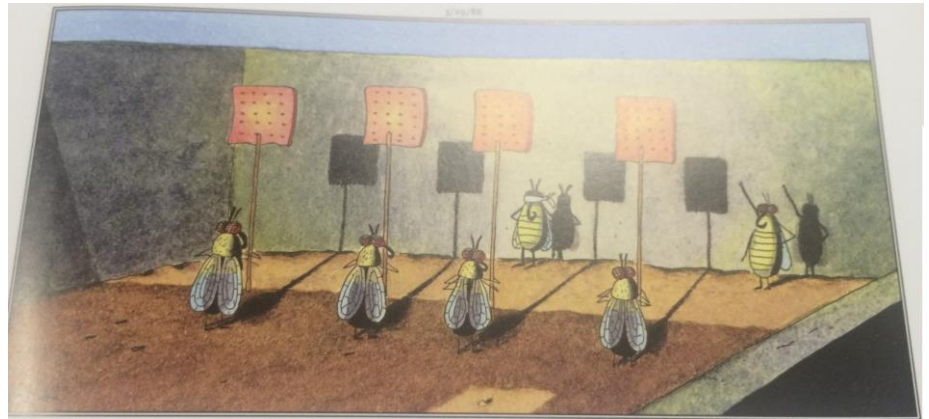
Invertebrate Zoology

Unit 5: Arthropods

Objective 1: Describe the form and function of Arthropods

Students should be able to:

- 1) Describe the form and function of Arthropods
- 2) Explain the common characteristics of the phylum Arthropods
- 3) Describe the respiratory, circulatory, digestive, reproductive strategies for Arthropods.



How to study:

- a) Read Pages: 374-376
- b) Understand vocabulary terms:

Jointed Appendage: An appendage is any structure, such as a leg or an antenna, which grows out of the body of an animal. Ancestrally, one pair to each segment, but number often reduced; appendages often modified for specialized functions

Tagmata: segmented body divided into functional groups

Cuticular exoskeleton; external skeleton containing protein, lipid, chitin, and often calcium carbonate secreted by underlying epidermis and shed (molted) at intervals; although chitin occurs in a few groups other than arthropods, its use better developed in arthropods

Tracheal tubes: branching networks of hollow air passages that carry air throughout the body.

Spiracles: Air enters and leaves the tracheal tubes through openings on the thorax and abdomen

Open circulatory system: a pumping heart, blood vessels and blood sinuses. Blood is pumped from the heart into open spaces.

Book lungs: air-filled chambers that contain leaf-like plates. The stacked plates of a book lung are arranged like pages of a book.

Pheromones: chemical odor signals given off by animals.

Antennae: are also used for sound and odor communication among animals.

Molting: Shedding the old exoskeleton.

Cephalothorax: an abdomen and a fused head and thorax

Simple eye: is a visual structure with only one lens that is used for detecting light.

Compound eye: is a visual structure with many lenses.

Malpighian tubules: Most terrestrial arthropods excrete wastes through Malpighian tubules. In insects, the tubules are all located in the abdomen rather than in each segment. Malpighian tubules are attached to and empty into the intestine.

Parthenogenesis: a form of asexual reproduction in which a new individual develops from an unfertilized egg.

Metamorphosis: Sharp change in form during postembryonic development.

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c) Complete, review, and understand the homework assignments on: Assignment 1 Unit 5 Objective 1

d) Understand the following notes: Insect Notes

Objective 2: Differentiate between the subphylums: Trilobita, Chelicerata, Crustacea, and Uniramia

Students should be able to:

- 1) Explain the characteristics of the members of the 4 subphylums
- 2) Describe the basic body structure of each subphylum.
- 3) Identify an example of each subphylum.

How to study:

a) Read Pages: 376, 387, 408

b) Understand vocabulary terms:

-Subphylum Trilobita: Examples include trilobites. All extinct forms; Cambrian to Carboniferous; body divided by two longitudinal furrows into three lobes; distinct head, trunk, and abdomen, biramous (two-branched) appendages.

-Subphylum Chelicerata: eurypterids, horseshoe crabs, spiders, ticks. First pair of appendages modified to form chelicerae; pair of pedipalps and four pairs of legs; no antennae; no mandibles; cephalothorax and abdomen usually unsegmented.

-Subphylum Crustacea: crustaceans. Mostly aquatic, with gills; cephalothorax usually with dorsal carapace; biramous appendages, modified for various functions; head appendages consisting of two pairs of antennae, one pair of mandibles, and two pairs of maxillae; development primitively with Nauplius stage

-Subphylum Uniramia: All appendages currently thought of as uniramous; head appendages consisting of one pair of antennae, one pair of mandibles, and one or two pairs of maxillae. Examples include: centipedes, millipedes, and insects.

c) Know these diagrams: Classification of Phylum Arthropoda (Pg 383)

d) Understand the following notes: Arthropods Notes

e) Complete, review, and understand: Assignment 2 Unit 5 Objective 2 and 3.

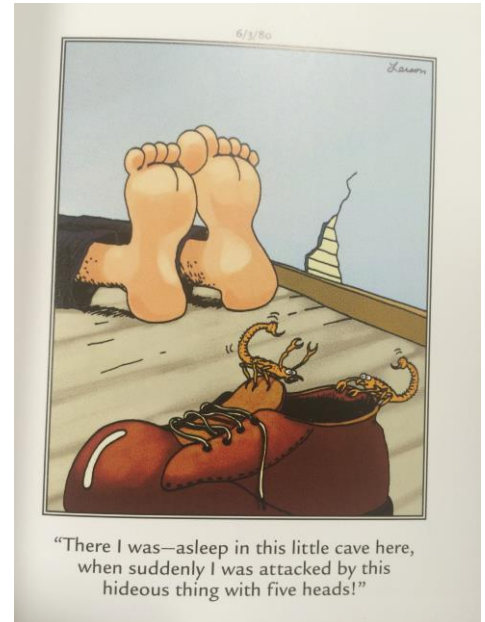
Objective 3: Differentiate between the classes of Chelicerata: (Merostomata, Archnida, Pycnogonida)

Students should be able to:

- 1) Explain the characteristics of the members of the 3 classes.
- 2) Describe the basic body structure of each class.

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3) Identify an example of each class.

How to study:

a) Read Pages: Pg 377-383

b) Understand vocabulary terms:

-Class Merostomata: aquatic chelicerates. Cephalothorax and abdomen; compound lateral eyes; appendages with gills; sharp telson; subclass Eurypterida (all extinct) and Xiphosurida, horseshoe crabs. Examples include *Limulus*.

-Class Pycnogonida: Sea Spiders. Small (3 to 4 mm). Some reach 500mm; body chiefly cephalothorax; tiny abdomen; usually four pairs on long walking legs (some with five or six pairs); mouth on long proboscis; four simple eyes; no respiratory or excretory system. Example: *Pycnogonum*.

-Class Arachnida: scorpions, spiders, mites, ticks, harvestmen. Four pairs of legs; segmented or unsegmented abdomen with or without appendages and generally distinct from cephalothorax; respiration by gills, tracheae, or book lungs; excretion by Malpighian tubules and /or coxal glands; dorsal bi-lobed brain connected to ventral ganglionic mass with nerves, simple eyes; chiefly oviparous; no true metamorphosis. Examples *Argiope*, *Centruroides*.

-Proboscis: a trunk or snout. Also tubular sucking or feeding organ with the mouth at the end as in planarians, leeches, and insects. Also, the sensory and defensive organ at the anterior end of certain invertebrates.

-Chelicerae: the anterior appendages which have terminal fangs through which run ducts from poison glands.

-Pedipalps: a pair of leg like appendages which have sensory function and are also used by males to transfer sperm.

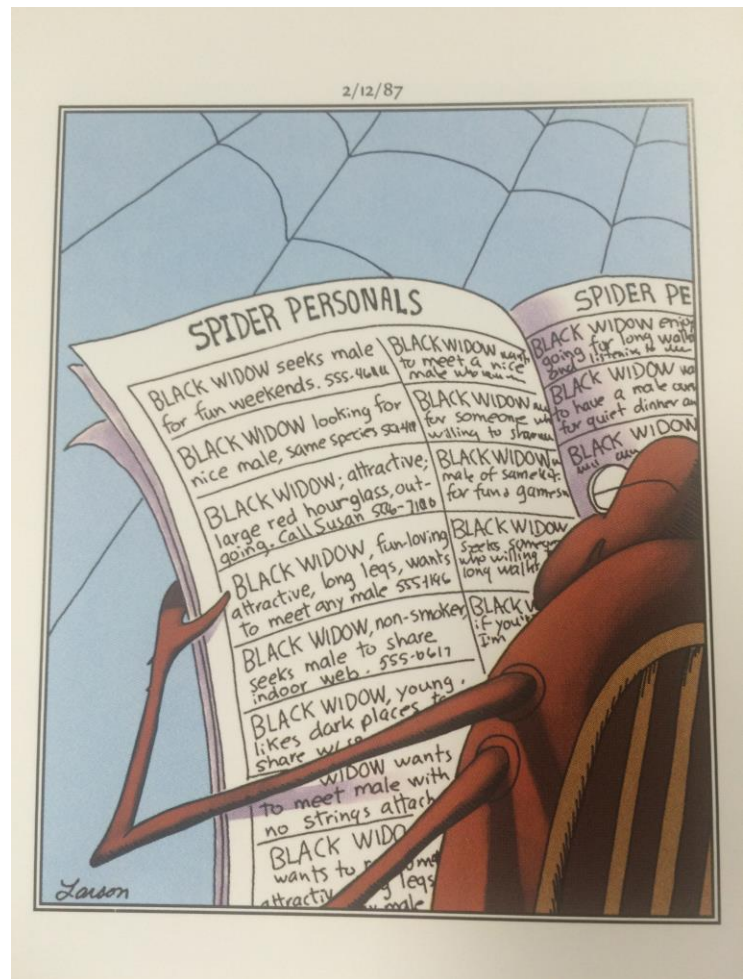
-Malpighian tubules: Most terrestrial arthropods excrete wastes through Malpighian tubules. In insects, the tubules are all located in the abdomen rather than in each segment. Malpighian tubules are attached to and empty into the intestine.

-Simple eye: is a visual structure with only one lens that is used for detecting light.

-Compound eye: is a visual structure with many lenses.

-Silk gland: Two or three pairs of spinnerets containing hundreds of microscopic tubes run to these glands to produce silk thread made of a scleroprotein.

-Spinnerets: is a silk-spinning organ of a spider or the larva of an insect.



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Fang: located at the end of a pair of chelicerae. They are tube like structures which can inject venom into a prey victim.

c) Complete, review, and understand: Assignment 2 Unit 5 Objectives 2 and 3 Inv Zoology.

d) Understand the following notes: Arthropod Notes

e) Diagrams to know: Classification of Phylum Arthropoda (Pg 383).

Objective 4: Describe the Internal Form and Function of Crustaceans

Students should be able to:

- 1) Identify the modes of respiration, circulatory, excretion, nervous system, and reproduction for Crustaceans.
- 2) Describe the external and internal features of Crustaceans

How to study:

a) Read Pages: 387-402

b) Understand Vocabulary Terms:

Antennae: are also used for sound and odor communication among animals.

Mandibles: The mandible of an arthropod is a pair of mouthparts used for either for biting, cutting and holding food. Mandibles are often simply referred to as jaws.

Maxillae: Paired maxillae cut food and manipulate it during feeding. Maxillae can have hairs and "teeth" along their inner margins.

Cephalothorax: an abdomen and a fused head and thorax.

Gills: respiratory structures for aquatic organisms which extract oxygen from the water.

Rostrum: (beak) A snout like projection on the head of an arthropod.

Carapace: A shield like plate covering the cephalothorax of certain crustaceans.

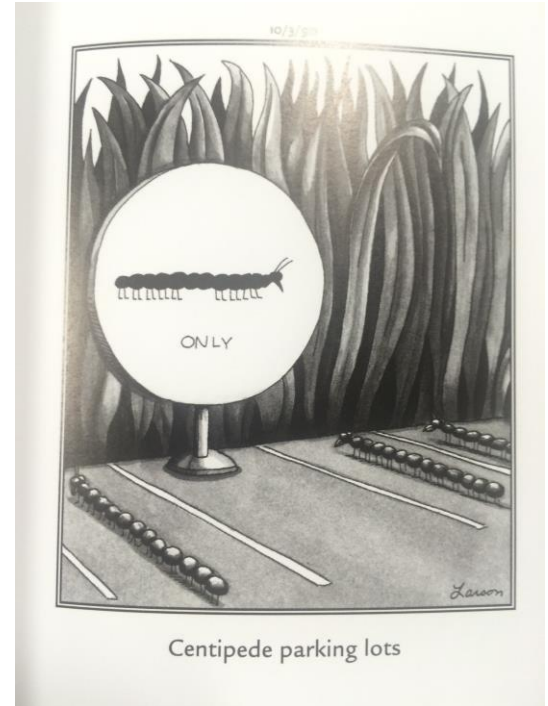
Telson: A non-segmented part of tail fan of arthropods.

Uropod: The last abdominal segments which make up the tail fan of arthropods.

c) Know these diagrams: 19-1 Pg387, 19-2 Pg 388, 19-5 Pg 391, 19-9 Pg 393.

d) Understand the following notes: Arthropod Notes

e) Complete, review, and understand: Assignment 3 Unit 5 Objective 4



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Objective 5: Differentiate between the classes of Arthropods (Chilopoda, Diplopoda, and Insecta)

Students should be able to:

- 1) Explain the characteristics of the members of the 3 classes.
- 2) Describe the basic body structure of each class.
- 3) Identify an example of each class.

How to study:

a) Read Pages: 408-436

b) Understand vocabulary terms:

-Class Chilopoda (centipedes) land forms with somewhat flattened bodies that may contain from a few to 177 segments. Each segment, except the one behind the head and the last two in the body, bears a pair of jointed legs. Appendages of the first body segment are modified to form poison claws. The last pair of legs is longer than the others and serve a sensory function. There are a pair of antennae, a pair of mandibles, one or two pairs of maxillae, and a pair of eyes on the dorsal side of the head.

They are carnivores and feed on cockroaches, and other insects and earthworms. They kill their prey with their poison claws and chew it with their mandibles. There are 3,000 species worldwide. Examples include *Scutigera*.

-Class Diplopoda (millipedes) "thousand feet". They don't really have 1000 feet. Each abdominal segment has two pairs of feet. They have cylindrical bodies that are made up of 25 to 100 segments. The thorax has 4 segments, each with 1 pair of legs. They have two clumps of simple eyes and a pair each of antennae, mandibles, and maxillae. They feed on decayed plant matter and are slow moving in comparison to centipedes. Many millipedes also protect themselves from predation by secreting toxic or repellent from special glands called repugnatorial glands which are positioned along the sides of the body. Examples are *Spiroboleus* and *Julus*. There are more than 10,000 species worldwide.

-Class Insecta (insects). Body with distinct head, thorax, and abdomen. Pair of antennae, mouthparts modified for different food habits, head of six fused segments, thorax of three segments, abdomen with variable number, usually 11 segments; thorax with two pairs of wings (sometimes 1 or 2 pairs) and three pairs of jointed legs; estimated number of insects are 1.1 million species. Examples include *Romalea* (grasshoppers), *Apis* (honey bees)



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- c) Know these diagrams: Fig 20-1 Pg 408; 20-4 Pg 411;
 d) Understand the following notes: Insect Notes chilopoda dilopoda insecta
 e) Complete, review, and understand: Unit 5: Assignment 4: Objective 5

Objective 6: Describe the process of metamorphosis and the reproductive strategies of Arthropods

Students should be able to:

- 1) Compare complete and incomplete metamorphosis.
- 2) Explain the various strategies of how insects reproduce.

How to study:

- a) Read Pages: Pg 420-421,
- b) Understand vocabulary terms:
 - Metamorphosis: Sharp change in form during postembryonic development.
 - Complete (holometabolous) Metamorphosis: a four stage process (egg, larva, pupa, and adult) in which the insect develops into a larva after hatching from an egg. They develop into a pupa then an adult which can reproduce. About 88% of insects use complete metamorphosis.
 - Larva: is the free-living, wormlike stage of an insect, often called a caterpillar.
 - Pupa: stage of insects is a period of reorganization in which the tissues and organs of the larva are broken down and replaced by adult tissues.
 - Incomplete (hemimetabolous) Metamorphosis: a three stage process (egg, nymph, adult) in which the insect hatches from the egg as a nymph and gradually grow into an adult. Grasshoppers and cockroaches are insects that undergo incomplete metamorphosis.
 - Nymph: the organism which hatches from the egg has the same general appearance as the adult but smaller in size. Nymphs cannot reproduce. As the nymph eats and grows, it molts several times. With each molt, it begins to resemble the adult more. Gradually, the nymph becomes an adult.
 - Internal fertilization: Males deposit sperm in a female's vagina during copulation. Eggs are fertilized inside the body of the female.



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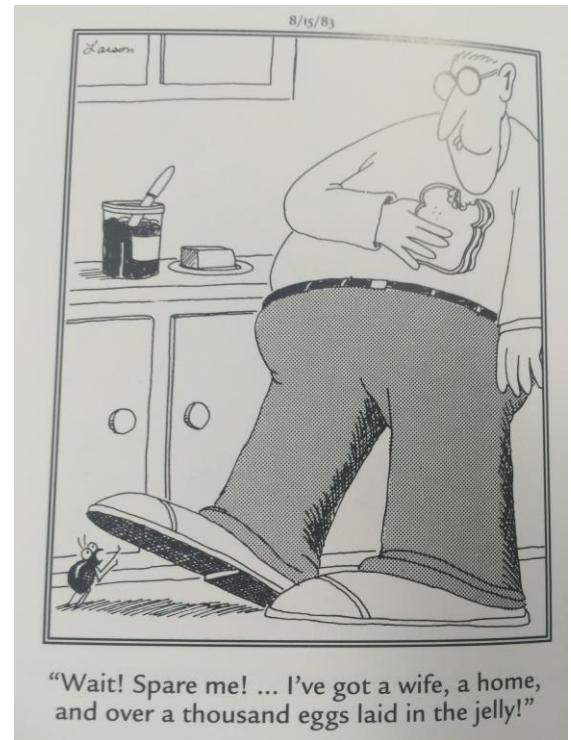
-Parthenogenesis: The development of an unfertilized egg into a viable adult. Offspring are genetically identical to the mother. Occurs prominently in Homoptera and Hymenoptera.

-Pheromones: chemical odor signals given off by animals.

-Instar: the stage between the molts for insects.

-Molting: Shedding the old exoskeleton.

-Diapause: an important adaptation to survive adverse environmental conditions. Diapause is genetically determined in each species and sometimes varies between subspecies in a species, but is usually initiated (started) by a particular signal such as daytime length or photoperiod. After diapause is initiated, another environmental signal is usually required to end it. Such signal may be return of favorable temperature after a prolonged period of cold or an occasion of rain after a dry period, as in a desert. The period of dormancy can happen during any part of an organism's life cycle from an egg to an adult. Winter dormancy is called hibernation. Summer dormancy is called estivation.

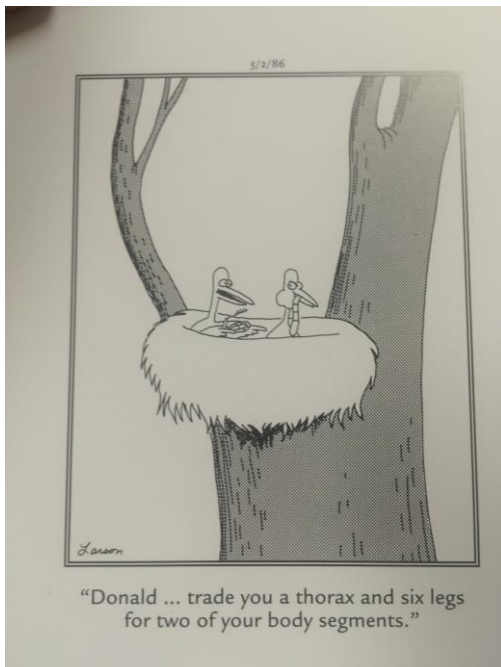


c) Know these diagrams: Fig 20-24 Pg 421

d) Understand the following notes: Insect Notes chilopoda dilopoda insecta

e) Complete, review, and understand: Unit 5:

Assignment 5: Objective 6



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