

PROTOSTOMATA

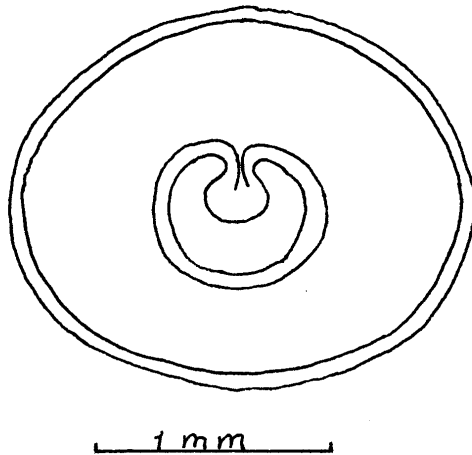
1. Look at the various living, preserved and fossil Annelids. What conspicuous feature gives the phylum Annelida?

- 2.a. Examine living *Lumbricus*. Describe the organism (color, and texture). Find the pronotum, mouth, genital pores, clitellum, and anus.

- 2.b. Describe the movement of the living animal. Place it on the benchtop. How successful is it in its locomotion? Then, place it in the palm of your hand? Describe the difference.

- 2.c. Rub the animal from head to tail and then from tail to head (on its side). What cause the difference in texture?

- 2.d. Look at a section of *Lumbricus*. Find: cuticle, epidermis, muscles, peritoneum, ventral nerve cord, dorsal blood vessel, ventral or subneural blood vessel, gastrodermal cells, coelom, typhlosole, intestinal lumen, and gastrodermis. Add any structures as needed to the drawing below.



3. Now examine living *Tubifex* worms. These animals usually live in oxygen-poor environments. What obvious character does the animal possess that attests to that?

- 4.a Find the living leeches, an assortment that includes *Hirudo medicinalis*, the medicinal leech. How do they move over the substrate? How do they swim?

- 4.b. What obvious character places them in the Annelida?

- 5.a. Polychetes have evolved a bewildering assortment of shapes. Find the preserved polychetes and be able to recognize them.

- 5.b. Pay particular attention to the sessile polychetes like the serpulid tube worms and the sea pen. By what general mechanism do they procure food?

- 6.a. *Nereis* is a free-living polychete. Look at a preserved worm and note aspects of its external anatomy. Describe the modifications of the segments that form the "head".

- 6.b. Find the demonstration slide of a *Nereis* parapodium. Describe the occurrence of setae. How is this structure adapted to its function?

7. Describe the fate of the following structures in mature members of the major Mollusk classes;

CLASSES	MANTLE	SHELL	MOUTH	FOOT	GILLS
AMPHENEURA					
SCAPHOPODA					
GASTROPODA					
PELECYPODA					
CEPHALOPODA					

8. Find the preserved chitons. What obvious feature makes them snail-like in their appearance?
- 9.a. Note living snails. Watch a snail as it crawls on a vertical glass surface (like an aquarium or beaker). How is its motion similar to that of *Dugesia*?
- 9.b. Watch the mouth. Describe its action while the animal crawls.
- 9.c. Examine a radula slide. How does its structure conform to its function in the snail?

10. Now look at the array of empty snail shells. Which aspects of the shell appearance seem to be the most conserved, and which ones seem to be most variable?
Conserved characters:
- Variable characters:
- 11.a. Examine a living freshwater clam. Find the excurrent and incurrent siphons.
- 11.b. Look at an array of living and fossil pelecypod shells. Note the structure of the shells. Find the pallial line, and umbo. What does the pallial line represent?
- 11.c. Describe the symmetry of a clam.
12. Look at the piece of wood riddled by ship worms. This was caused by a clam called *Toredo*.
13. Now, look at an array of living and fossil clam shells. What appear to be conserved and variable characters among pelecypods?
Conserved characters:
- Variable characters:
- 14.a. Find a preserved cephalopod. Describe how this animal has adapted to a predatory existence.
- 14b. Examine the demonstration slide of *Loligo*. This is a whole mount of a very young animal. Find the eyes, gills, mantle, mouth, and foot.
15. *Nautilus* has an ancient body plan among cephalopods. Look at the cut away *Nautilus* shell and compare that with the fossil ammonoids, nautiloids, and belemnites on demonstration.

16. Find the culture of living tardigrades. Describe their movement and appearance. Are you surprised to learn that they are called "water bears"?

17. Carefully examine a preserved demonstration of *Peripatus*. How is this animal like an annelid? How is it like an arthropod?

18. Trilobites represent a very successful group of animals that died out by the end of the Paleozoic Era.. What common features can you discern from among the demonstration fossils?

19. *Limulus*, the horseshoe crab, resembles a the trilobites. Find the major body regions. On a preserved animal find: book gills, chelicerae, compound and simple eyes, and the caudal spine or telson.

- 20.a. Examine the preserved scorpions. How many legs do they have?

- 20.b. Describe the sting.

- 20.c. How is a scorpion like *Limulus*?

- 21.a. Similarly, look at preserved spiders. Use the dissecting microscope and find their chelicerae and fangs.

- 21.b. How many eyes do they have? Are they all the same?

- 22.a. Find the culture of *Triops* and *Eubbranchipus*. For both taxa describe the appearance and methods of swimming.
- 22.b. What structures do they use for locomotion?
- 22.c. *Artemia* (brine shrimp) is a common hypersaline crustacean. Note the eggs and developing larval stages. Describe the nauplii swimming in the medium. Adult brine shrimp resemble *Eubbranchipus*.
23. Find a variety of living and preserved crustaceans. Be able to identify the cephalothorax, abdomen, antennae, gills, eyes, and legs in the following:
- *Daphnia*
 - *Cyclops*
 - Ostracods
 - Amphipods
 - Isopods
 - Crab (particularly the slide of a larval crab)
 - Lobster
24. Now look at preserved barnacles. How have they become modified from the basic crustacean plan?
- 25.a. Compare the differences between preserved millipedes and centipedes.
- 25.b. Now watch a living millipede walk. How does it superficially resemble an earthworm?

25.a. Insects comprise one of the largest groups of living things. Look at the array of insects out on demonstration. Find the legs, head, thorax, spiracles, and abdomen in all mature insects provided.

25.b. Which of them have wings?

25.c. Which of them have complete metamorphosis?

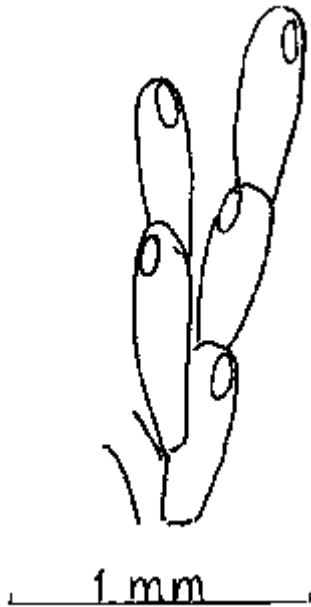
25. Mealworms are larval beetles. Find and describe all stages in the complete metamorphosis of that beetle.

26.a. Ants and termites superficially resemble each other but are not closely related in the insect clade. How are they similar?

26.b. Examine their social interactions. How do they appear to "greet" each other?

27.a. Examine specimens of preserved and fossil ectoprocts. How do they resemble colonial hydroids? This kind of resemblance of organisms in different clads is called what?

27.b. Find the whole mount slide of *Bugula* or *Pectinatella*. Add the zooids to the drawing below. Find and add the lophophores.



28.a. Once one of the most abundant organisms in the oceans, brachiopods have a very rich fossil record. What about these animals would allow them to fossilize and leave a record?

28.b. They resemble clams. How do their shells differ from those of clams?

29.c. Also, their mode of feeding resembles that of clams. What is it? What structures do they use for feeding?