Biology 337 **Laboratory syllabus**
Biology of Invertebrates **Dr. Bob Podolsky**

I hear and I forget. I see and I remember. I do and I understand. – Chinese Proverb

OVERVIEW

The laboratory portion of Biology 337 is a hands-on opportunity to learn about the structure and function of the major invertebrate body plans. You will examine living and preserved specimens, many collected locally and some sent from other biological field stations.

Each week you will complete exercises that include observations, dissections, drawings, and thought questions. A handout will guide you through these exercises; additional paper will be available for you to complete drawings. Given the scope of the course, it should not be surprising that there is a lot of material, and you must try to use your time efficiently. Keep all handouts, exercise sheets, and drawings organized for use when studying for the lab practical exams (guidelines available at the course website).

We will meet for lab once a week for three hours. You are expected to attend every lab and to remain for the duration. **Given the nature of the material and how it is displayed, there will be no opportunity for make-up labs--lab day is the only day you will have access to the material.** The scheduled labs are therefore your only chance during the semester to create a notebook that will help you to study for exams and to recall information in the future. The material may be wet and/or dirty, so dress appropriately. On weeks with field trips (toward the end of the course) you will be notified in advance of appropriate gear to bring.

Feedback: Each week the TA will assess drawings, look over answers to select thought questions (TQs) and assign a grade based on (1) your level of effort in creating extensive, labeled, scaled, and informative drawings and (2) your thoughtfulness in answering TQs. She will not evaluate all of your answers or drawings in depth, so it is **your responsibility to ask for specific feedback** on drawings, ideas, and progress. You must work efficiently to complete as much as you can on the day of the lab; you can hand in the worksheet that day or at the following lecture.

TENTATIVE SCHEDULE

Wk	Date	Laboratory topic
1	Jan 10	A. Cladistics and the Boltozoa
2	17	B. Porifera, Cnidaria I (Hydrozoa, Anthozoa)
3	24	C. Cnidaria II (Scyphozoa/Cubozoa); Ctenophora; Worms I (Platyhelminthes)
4	31	D. Worms II (Nematoda, Nemertea, Annelida)
5	Feb 7	**Midterm exam I** (Lecture/reading and laboratory portions)
6	14	E. Mollusca I (Polyplacophora, Gastropoda); parasites
7	21	F. Mollusca II (Bivalvia, Cephalopoda)
8	28	G. Arthropoda I (Trilobitomorpha, Crustacea)
9	Mar 6	H. Echinodermata
10	13	I. Urochordata, Lophophorates (Brachiopoda, Bryozoa, Phoronida)
11	20	---*spring break*---
12	27	**Midterm exam II** (Lecture/reading and laboratory portions)
13	Apr 3	J. Arthropoda II (Chelicerata, Tracheata); Tardigrada [field trip for forest collection]
14	10	K. Benthic communities [field trip for boat trawling]
15	17	L. Planktonic communities & larval biology [plankton towing]

GUIDE TO LABORATORY WORK

Your notebook will become a record of all you have seen and done in the lab. You should use worksheets and blank drawing pages in creative ways to develop your observational skills: pose questions (that you later plan to answer through readings and discussions with me), create cartoon diagrams of how things work, make "blow-up" sketches that show important details, and record size info, collection info, and page numbers for further reading. *Try to create drawings and notes that would be not only interpretable but also helpful five years from now.*

Drawing as an aid to observation. You don't need great artistic skills to make useful drawings. In fact, "beautiful" drawings can be far less useful than drawings that bring out details you actually saw, along with other useful information. In light of digital photography, it may seem pointless to labor over drawings and seek out details that have been described countless times. But remember: **the *process* of taking a photograph does not replace the *process* of drawing**. Your observations and their representation on paper are part of a learning process that forces you to pay attention to how individual parts relate to one another and how they differ from one organism to the next. When focused on drawing, your brain "sees" and stores more detail than when taking and looking at a more detailed photograph.

Bring to lab: Simple dissection tools (scissors, forceps), pencil(s)/eraser, the Pechenik textbook, looseleaf binder, copy of lab handout—plus, a desire to develop good microscope and drawing skills, including how to estimate and record size information.

My general expectations. That you will…

- …*practice your scientific skills*. Do not be surprised if I answer your question with a question. If I were to give you the answer, you would hear a fact, but if instead I help you to come to the answer, you will the process of answering your own questions. Rely heavily on *inference* and on the *process of elimination*. For example, if you don't know what a structure is in a dissection, first figure out (with the help of diagrams) what it *cannot* be, see what it connects to, note its size, color, likely contents, etc. Look for and use clues. Be a scientist.
- …*develop good microscope skills*. Make sure eyepieces are adjusted correctly and use both of them—the dissecting microscopes are designed to provide a stereo-image using the two eyepieces. If the lighting is bad, let me know, and I'll show you how to fix it.
- …*develop good drawing skills*. Follow my suggestions below for what to include in drawings. You won't have time to draw everything, so make good decisions. Do drawings only when they will be useful for helping you to observe and remember information.
- …*put thinking, effort, and creativity into answering thought questions*. You are encouraged to talk with classmates and with me to write thoughtful, often speculative, sometimes fanciful answers to the questions posed.

Suggestions for what to include in your drawings:

- Sketch in **pencil** with a light hand to make erasing easier. **Use color sparingly** and only to provide information.
- Make your sketches **large** to accommodate parts and labels. It is often better to do a highly simplified sketch or outline of an animal and then **"magnify" details of anatomy in smaller blow-up sketches**. Don't waste your time drawing detail that is uninformative or drawing

repeated structures over and over again. Make your drawing decisions based on what I emphasize and what you will learn from them.

- **Label profusely** with relevant information, including the phylum/class/species name, names of structures, where it was collected, and page numbers of material you referenced. Always **report size** by including a scale bar, overall size, or at least the total magnification (e.g. 200X).
- Pepper your sketches with **little notes and questions** about the function of structures, speculations, comparisons to other organisms, habitat and lifestyle descriptions, and results of simple experiments. Try ultimately to record answers to any questions.
- Draw **only what you see**, not what a photograph or drawing suggests you should have seen.

Examples! The following page includes a collection of successful drawings by a student in a previous class. Note that her drawings are simple, and she includes size information, labels, notes about her observations, and small blow-ups to show details of structure

Resources. Use your textbook and other published sources as an aide to understanding what you see; in turn, use your laboratory experience as inspiration for further reading. Refrain from extensive reading while in lab, but record passages to read in greater detail later. Collaborate with peers--show them discoveries, ask them questions, and together seek out answers. Make use of your instructors as well, but also try to become comfortable with seeking out information from your textbook and other references housed in the lab. One of the most useful skills you can develop as a scientist is to reach conclusions based on the information available, using both deduction and the process of elimination.

Etiquette: Return material to the place where others expect to find it. Keep your own space clean, leave common spaces cleaner than you found them, and take good care of the microscopes, which rust easily around salt water. **Reserve the last 5-10 min for cleaning everything you used.** Return everything to the condition and location where you found it at the start of the lab period.

Microscopes. Many invertebrates are, or have parts that are, too small to see well without magnification. You will use two types of microscopes, Stereo-Dissecting and Compound:

Stereo-dissecting Compound

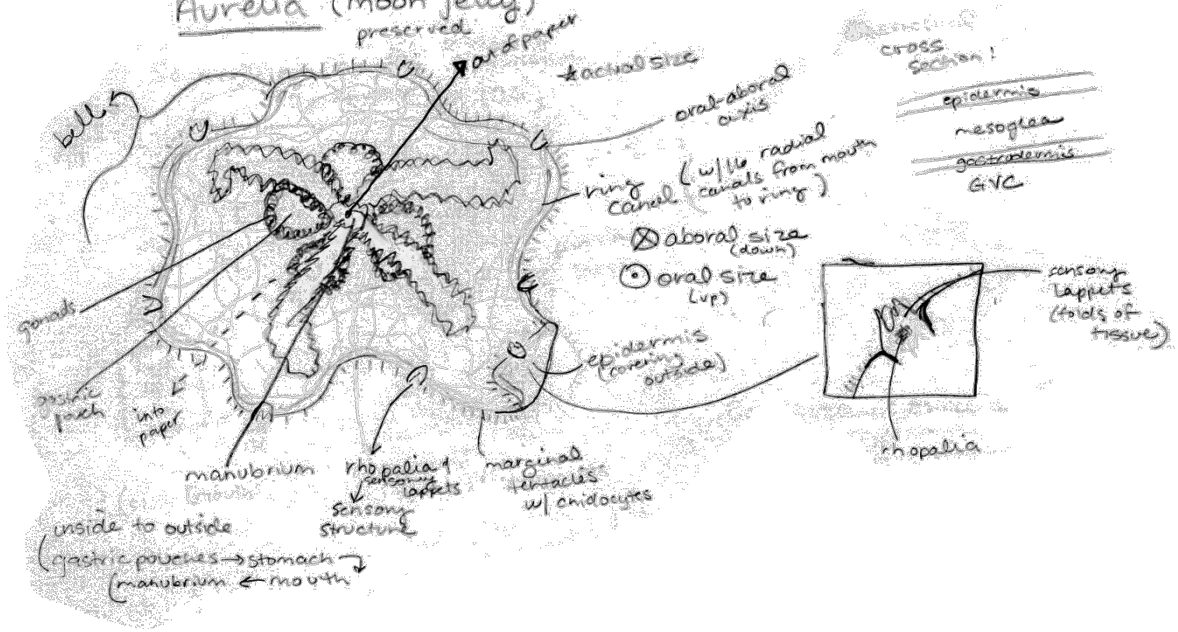
Microscopes are expensive and must last a long time. Keep these basic rules in mind for most effective use:

1. Carry the scopes with two hands.
2. Focus first through the left eye and then adjust the right eyepiece focus for the best 3D view.
3. Keep the scopes from getting wet, especially with saltwater (they rust very easily!).
4. Turn the scopes off when not in use (specimens are easily cooked by the light).
5. Use only moistened lens paper to clean microscope lenses and eyepieces—ask an instructor for help.

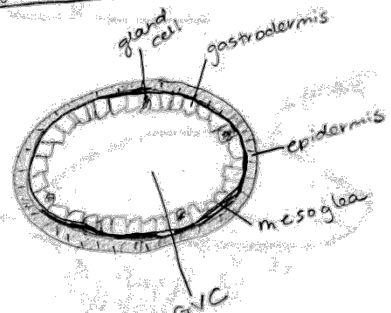
Helpful hint: To avoid crushing small and delicate specimens when you prepare a slide wet-mount, use a depression slide, or try propping the cover slip up over the specimen by putting a nick of clay on each corner of the cover slip. Ask your instructor for help.

Cl. Scyphozoa

Aurelia (moon jelly) preserved

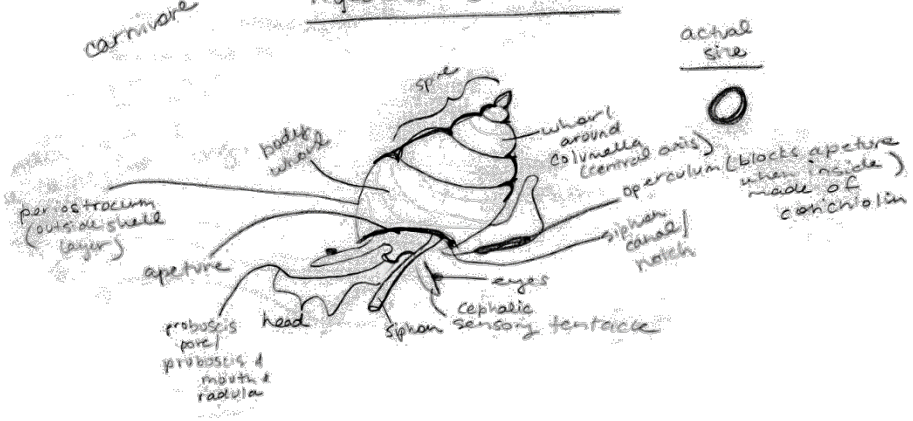


Hydra x10

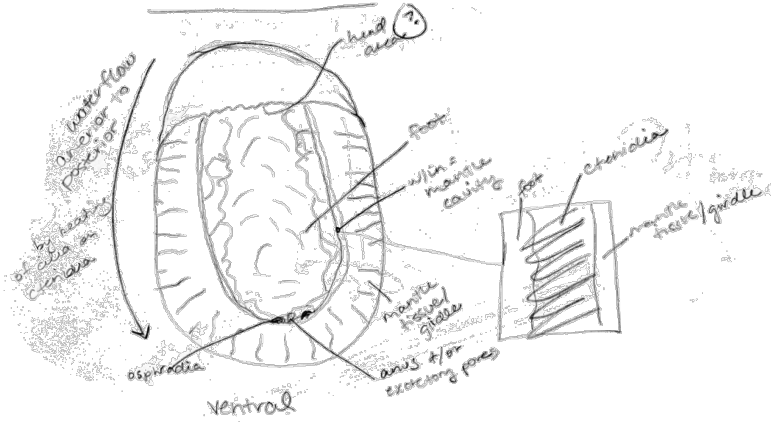


O. Neogastropoda

Ilyanassa obsoleta live



Preserved chiton (actual size)



CofC SAFETY POLICIES

During this course, you may be exposed to potential hazards in the laboratory and field. Participation in the course requires that you adhere to the following safety standards. Students that do not follow these standards will not be allowed to participate in lab or field activities. Any coursework missed as a result will be treated as an unexcused absence.

1. **You are responsible for knowing the hazards** associated with materials used in the laboratory and environments and organisms that may be encountered in the field. Listen to all instructions and ask questions if you do not understand something.
   a. The lab will make use of specimens preserved in aqueous solutions of 50% isopropyl alcohol or 70% ethyl alcohol, which can be potentially hazardous. The MSDS safety information for both preservatives is available in the lab room and on the lab computers.
   b. Potentially dangerous animals may be encountered on field trips. Do not touch animals with your hands unless they are confirmed to be non-venomous.
2. **Know the appropriate emergency response procedures and the location of safety equipment**. If there is an injury or emergency, call **953-5611**. Know the location of telephones, eyewash, safety shower, fire extinguisher, fire alarm, and building exits.
3. **Do not work alone** in the laboratory if you are working with hazardous materials or equipment. Do not work alone in the field; always work in pairs or groups.
4. **Do not engage in horseplay, pranks or other acts of mischief** while in lab or on field trips.
5. **Drinking, eating, and application of cosmetics is forbidden** in the laboratory. Smoking is forbidden in all College buildings and vehicles, and on field trips.
6. **Closed toe shoes are required** in the laboratory and in the field. The heel and top of foot must be covered. Sandals and perforated shoes are not permitted.
7. **Protective gloves will be available** in the laboratory for anyone who wishes to wear them. Students are required to provide protective eyewear if needed. If skin irritations are detected, **wash exposed surface with mild soap and plenty of water**. If alcohol is splashed in the eyes, **immediately flush eyes** with plenty of water for 15 minutes using the eye wash.
8. **Appropriate clothing must be worn** on field trips, as described by the instructor, including long pants, long-sleeve shirts, and sturdy, closed toe shoes.
9. During field trip travel, **seatbelts must be used** at any time that the vehicle is in motion.
10. **Broken glass and any other sharp objects should be disposed of** in their respective specially labeled containers in the laboratory.
11. **Clean up the work area** when you are done. Before leaving the laboratory or field vehicles, you are responsible for making sure your space is clean and organized.
12. **Always have your College of Charleston identification and insurance information** with you when working in the lab or field. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.
13. **Report any accident or injury, however minor**, to the instructor immediately. A report form must be completed and forwarded to the department chair, dean, and Director of Environmental Health and Safety.