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This course will examine the invertebrate phyla with particular regards to functional morphology, phylogeny and ecology. The evolution of invertebrates will be an underlying theme throughout the course, and students will study the science of evolution through text readings and oral presentations. The proximity of TESC to various marine, fresh-water and terrestrial habitats provides excellent opportunities to study many diverse groups of local organisms, and emphasis will be placed on learning the regional invertebrate fauna. Fundamental laboratory and field techniques in zoology will be learned, and students will be required to complete a research project utilizing the available microscopy facilities. A strong commitment to work both in the field and in the lab is necessary to complete this program.

**NOTE: Students must show up on time to the first class period on March 30<sup>th</sup> or they will be dropped from the program.**

**Weekly Schedule** (BEWARE: There are many exceptions to these standard times! Technical problems or inclement weather may require substantial changes.)

<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>	<b>Friday</b>
Workshops	Lecture/Lab	Evolution	Lecture/Lab	Lab
As needed	9:00 <sup>1</sup> -3:30 <sup>2</sup>	10:00-12:30 <sup>2</sup>	9:00 <sup>1</sup> -3:30 <sup>2</sup>	9:00 <sup>1</sup> -12:00 <sup>2</sup>
Microscopy labs	Lab I 3041	Library 2205	Lab 1 3041	Lab I 3035
	<sup>1</sup> or earlier as needed	<sup>2</sup> or later as needed		

**Email**

All students must have an email account and agree check it regularly. It is unlikely that I will return a phone call. Some assignments may be sent and/or collected via email. All students must send Erik an email message by 18:00 on Thursday of week one with "IZE email" as the EXACT subject line.

**Lecture**

Lectures will be integrated with labs. Lecture topics will cover all the invertebrate phyla and major suprataxa (although the class Hexapoda will only be covered cursorily). Particular attention will be paid to distinguishing characteristics, evolutionary relationships, and important ecological roles. Attendance at lectures is mandatory, and it is expected that students will have read the assigned material from the text (Brusca & Brusca) before lecture. *There will be several pop quizzes throughout the quarter*, and a take-home examination on the assigned reading and lecture material is due May 28<sup>th</sup>. Students that do not complete reading assignments or attend lectures may be asked to exit the program without credit.

**Evolution Seminar**

Seminars will cover the topic of evolution and will be conducted as a student-run advanced science seminar. During the first seminar period, students will be assigned readings from the text (Stearns & Hoekstra) and supplementary reading (Gould). During each seminar period, ~4 students will be responsible for lecturing on the assigned material. This, of course, will require substantial extra time in the library researching background material necessary to thoroughly understand and present the assigned chapter. There are no allowances for missing seminar on the presentation date or changing dates after the first week of class. Attendance at all seminars is expected, and all students are required to have read the material before seminar each week. Students that do not complete reading assignments or attend lectures may be asked to exit the program without credit. There will be one final exam (short essay format) on May 19<sup>th</sup> covering the assigned evolution material. Each student must submit by email three questions with an answer key covering their seminar presentation material for the final exam. Students that do not submit an email with appropriate questions (short essay format) and correct answers by noon on May 14<sup>th</sup> will automatically fail the exam.

## Books

These five books are required and will be available in the bookstore.

- Brusca, R. C. and G. J. Brusca, 2001. *Invertebrates*, Sinauer Associates ISBN 0878390973  
Stearns & Hoekstra, 2000. *Evolution*, Oxford ISBN: 0-19-854968-7  
Gould, S. J. (1989). *Wonderful life*, Norton ISBN: 039330700X  
Kozloff, E., (1996). *Marine invertebrates of the Pacific Northwest*, Univ. Wash. Press ISBN: 0295975628  
Nybakken, J., *Diversity of the invertebrates: A laboratory manual, Pacific Coast version*  
McGraw Hill ISBN: 0697151204 **OUT OF PRINT Buy used or Borrow.**

A compact field guide to local marine invertebrates is required. One of these two is suggested. There are others also.

- Kozloff, E. 2001. *Seashore life of the northern Pacific coast*, University of Washington Press ISBN: 0295960841  
Gotshall, D. 1994. *Guide to marine invertebrates: Alaska to Baja California*. Sea Challengers, Monterey, CA. ISBN: 0930118197

Optional Books available in the Evergreen book store for those of you with special interests (The first four published by Sea Challengers, Monterey, California)

- Pacific Coast Crabs and Shrimps* 1995. G.C. Jensen.  
*Guide To Marine Invertebrates - Alaska To Baja California*, 1994. D.W. Gotshall.  
*Pacific Coast Nudibranchs - A Guide to the Opisthobranchs, Alaska to Baja California* (Second Edition Revised). 1991. D.W. Behrens.  
*Pacific Coast Pelagic Invertebrates - Alaska to Baja California*, 1998. D. Wrobel and C. Mills.  
Lambert, P. 1997. *Sea Cucumbers of British Columbia, Southeast Alaska and Puget Sound (Royal British Columbia Museum Handbook)* University of British Columbia Press, Vancouver  
Lambert, P. 2000. *Sea Stars of British Columbia, Southeast Alaska and Puget Sound (Royal British Columbia Museum Handbook)* University of British Columbia Press, Vancouver

## Laboratory

Investigations of organisms from all the major invertebrate phyla will be done in the laboratory. Students will keep a notebook with drawings of their observations and dissections. A minimum number of organisms for observation and dissection will be assigned, and students are encouraged to complete more detailed observations of other organisms that interest them. Plain white paper sketchbooks for lab are available in the bookstore (8.5\*11, Strathmore Sketch Notebook, 60 pound paper). A set of coloured pencils is suggested. The scheduled lab time is not sufficient to complete this program, and the lab will be open on a regular basis at other times. A key to the lab is located in the key box on the doorknob of room 3035. The combination will be announced in class. Students are **not** allowed to work unaccompanied in the laboratory, and must have at least one lab partner after normal class times. It is expected that students will make use of this opportunity on weekends and in evenings in order to complete their work. In addition to regular labs, all students will complete a microscopy research project on an organism of their choice (see below). There will be a laboratory practical examination towards the end of the quarter. Participation in the final Laboratory Clean-up is Mandatory. Students will lose credits for not participating in this last laboratory "exercise". **Note: students not wishing to undertake dissection should take advantage of a different program and withdraw from "Invertebrate Zoology and Evolution".**

## Upper Division Credit

It is possible to get 16 upper-division science credits in this program if your performance is quantitatively and qualitatively at an advanced level. Requirements for laboratory assignments and exams will be delineated clearly.

## Field Trips

We will take several field trips to collect animals during scheduled lab periods. Participation on field trips is mandatory. Local field trips will include the Evergreen beach, Budd Inlet, etc. The starting times of field trips may vary substantially according to the tides. Times will be announced in class. Students will need to make their own car pool arrangements for transportation on field trips less than 16 km. We will go to the Rialto Beach tide pools on the NW coast of the Olympic Peninsula for 4 days/3 nights during the full moon low tides in May (Week 6: Tuesday, 5/4 to Saturday, 5/8). We will hike in and stay in tents. We will get up early to observe animals at low tide. The fieldtrip fee for Rialto will be about \$100.00. This does not include food or camping gear. Transportation will be by Evergreen van; you will be billed through Student Accounts (x6447). This trip will be physically strenuous.

## Species Account

Each student will be responsible for completing a thorough species account for the Evergreen Biota Web Page. Please see the webpage (<http://www.evergreen.edu/ants/TESCBiota/TESCBiota.html>) for more information. You must make a decision on your species for the species account web page by Thursday, April 8<sup>th</sup>. The species accounts are due at the Invertebrate Potluck, Wednesday, May 12<sup>th</sup>. The species you choose must be found on the Evergreen Campus.

## Microscopy

Students will become proficient in the use of light microscopy through practice in lab, assigned readings, and worksheets. These will be followed with a take home exam. All students will be required to attend Scanning Electron Microscope (SEM), Advanced Microscopy and Automontage training sessions during the first few weeks of the quarter and pass their "drivers license examinations" on these three instruments by the end of week 5. Students which fail to attend two reserved training sessions will be "black listed" by the science instructional staff; this will result in loss of credit. The **microscopy research project** will focus on the functional morphology of an invertebrate and/or the comparative morphology of closely related organisms. Research subjects must be chosen by the end of the third week. It is expected that students utilize at least two different types of microscopy, and the results will be presented in a Poster Session at the end of the quarter. Students can undertake their projects by themselves or in partnership with one other person (i.e., two is the maximum group size).

## Invertebrate Potluck

On Wednesday, May 12<sup>th</sup> at 5:30 PM we will meet at the Organic Farm for a class potluck. One of the goals of this potluck is to maximize the biodiversity of our meal. This won't be a success if every one brings shrimp and lobster, so there will be a sign up sheet in the lab to coordinate organisms. Since this is an 'educational experience', **attendance is mandatory. Mark your calendars now!** Guests are welcome, but no alcohol is allowed at the organic farm. Your final species account web page is due at this potluck! We will all look at them after eating.

## Invertebrate Spelling Bee

Week 8, on Tuesday, May 18<sup>th</sup>, at Noon, all students in this program will enter the Invertebrate Spelling Bee. All students in this program are expected to pass at least the first round. Students aiming for upper-division credit should be aiming to pass at least two rounds. **Participation is mandatory. There is a prize.**

## Some Selected Important Dates to Remember

Boat Day: Thursday & Friday Week 1 (4/1 & 4/2) ALL DAY  
Microscopy Exam and Deadline for receiving SEM drivers License: Friday Week 5 (4/30)  
Hard copy draft of Species Accounts due: Thursday Week 5 (4/29)  
Rialto Field Trip: WEEK 6: TUESDAY-SATURDAY (5/4-5/8)  
Clam Dig, Monday (5/10) 3:45 PM Week 7  
Invertebrate Potluck: Wednesday, May 12<sup>th</sup>, 5:30-9:30 PM  
Eugene Kozloff, Guest Lecture, 6:00 PM, Location TBA  
Week 8, on Tuesday, May 18<sup>th</sup>, at Noon: Invertebrate Spelling Bee  
Week 8: Final Evolution Exam: Final Exam in Evolution May 19<sup>th</sup>.  
Week 9: Down Week: Turn in Take Home Zoology exam by Friday 5:00 PM (5/28)  
Week 10: Final Zoology Lab Practical Examination & Lab notebooks due Tuesday 6/1  
Week 10: Project presentations/Poster session: Wednesday 6/2  
Week 10: Mandatory Lab Clean Up on Thursday 6/3

## **COVENANT**

1. If you are having difficulty with some aspect of the reading assignments, lectures, seminars, laboratory work, presentations or projects please see me ASAP in order to minimize potential problems and negotiate loss of credit.
2. You must read the syllabus and all other handouts.
3. You will send Erik an email message by 18:00 on Thursday of week one with "IZE email" as the EXACT subject line. Students not doing this will be dropped from the class.
4. You will maintain an email account and check it daily.
5. All assignments must be completed on time.
6. Missing assignments, seminars, labs, *et cetera* will result in loss of credit.
7. No make-up exams will be given.
8. Assignments turned in after the due date will not be evaluated.
9. Incompletes will not be awarded.
10. You are responsible for contacting me with any problem that arises.
11. The Evergreen Social Contract will be followed at all times (<http://www.evergreen.edu/social.htm>).
12. Plagiarism will result in dismissal from the program and loss of all credit for the entire quarter. If this is unclear to you, please visit these two websites, <http://www.fas.harvard.edu/~expos/sources/chap3.html> & <http://www.evergreen.edu/studenthandbook/rules.htm>, for information about avoiding plagiarism.
13. I will send out 5<sup>th</sup> week warning letters at the start of week six to inform students that may be in danger of losing credit at that time. I will invite those students to discuss this with me during a week 6 appointment.
14. By continuing in the program beyond the first day, students agree to complete the course as outlined in the syllabus.
15. Students will complete a self evaluation and an evaluation of Erik before their evaluation conference.
16. I will complete all evaluations in a timely manner.

**If there is something in the program syllabus, schedule or covenant that is not acceptable, you should not enroll in "Invertebrate Zoology and Evolution".**