

SIO 183/283: PHYCOLOGY: Marine Plant Biology

WINTER 2014

LECTURE: T, TH 1230-1340, Hubbs Hall 3300

LAB: 1400-1650, Hubbs Hall 3300

INSTRUCTOR:

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GRADING OPTION:

Letter Grade Only



WHAT THIS COURSE IS ABOUT

This course focuses on the biological study of photosynthetic organisms that live in the sea. These include (1) planktonic and benthic prokaryotic and eukaryotic microalgae, (2) benthic macroalgae (seaweeds), and (3) terrestrial plants that have reinvaded the sea (seagrasses). As marine microalgae are treated in other SIO courses and seagrasses are better suited for a general Botany course, this class focuses almost entirely on seaweeds. During the quarter we will touch on the following themes:

- 1) **Evolution and taxonomy of the major seaweed groups**
- 2) **Anatomy and morphology of the major seaweed groups**
- 3) **Seaweed ecology & physiology**
- 4) **Seaweeds, climate change & human affairs**

In studying the seaweeds of California in this course, you will learn how to: (1) identify common California seaweed taxa; (2) understand the key processes leading to seaweed taxonomic diversity; (3) explain general seaweed biogeographic and diversity patterns; (4) diagram seaweed life histories as well as seaweed anatomy and morphology; (5) study seaweed biology using microscopic techniques; (6) prepare seaweed herbarium specimens; and (7) conduct intertidal surveys for seaweed diversity and, (8) conduct basic laboratory experiments.

TEXTBOOKS:

There is no single phycological textbook that encompasses all of the subject matter we will cover in this course. As such, the required texts are *Algae (2nd Edition)*; *Graham, Graham and Wilcox (2009)* and *Marine Algae of California, Abbott and Hollenberg (1976)*. I would also recommend *Seaweeds of California by Mondragon and Mondragon* (suggested) and *Seaweed Ecology & Physiology, Lobban and Harrison (2000)*. I will provide weekly reading materials as PDFs as needed on the class website in addition to the class lectures and lab assignments as outlined below in the class schedule.

Books & Abbreviations (used below):

MAC: Marine Algae of California; Abbott and Hollenberg (1976); GGW: Algae (2nd Edition); Graham, Graham and Wilcox (2009); L&H: Seaweed Ecology & Physiology; Lobban and Harrison (2000)

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DATE	LECTURE	LAB	READING
Jan 7, 2014	Introduction to the course and Phycology	Basic laboratory skills; microscope use and care, herbarium presses	GGW pg 1-16 L&H pg 1-69 MAC pg 1-19
Jan 9, 2014	Diversity of algae	Use of taxonomic keys; basic vocabulary for seaweed IDs, slide making; overview	GGW pg 78-93 MAC 769-781
Jan 14, 2014	Taxonomy & Biology of Cyanobacteria	Cyanobacterial diversity	GGW pg 94-121
Jan 16, 2014	Taxonomy & Biology of Chlorophytes (green algae) Part 1	Overview of green algal classes-green algae Part 1; Field trip at end of lab	GGW pg 353-365; 373-403 MAC pg 51-120
Jan 21, 2014	Taxonomy & Biology of Chlorophytes (green algae) Part 2	Focus on Ulvophyceae-green algae Part 2	GGW pg 353-365; 373-403 MAC pg 51-120
Jan 23, 2014	Taxonomy & Biology of Rhodophytes (red algae) Part 1	Overview of red algal classes and orders Part 1-All	GGW pg 309-352 MAC 279-744
Jan 28, 2014	Taxonomy & Biology of Rhodophytes (red algae) Part 2	Overview of red algae - Part 2-Floridiophyceae; Field trip around SIO/work on herbaria	GGW pg 309-352 MAC 279-744
Jan 30, 2014	Field trip around SIO, sample collecting and work on herbaria		
Feb 4, 2014	Taxonomy & Biology of Rhodophytes (red algae) Part 3	Overview of red algae - Part 3	GGW pg 309-352 MAC 279-744
Feb 6, 2014	Review for Midterm	Free lab to work on herbaria ---Paper Topics Due---	-
Feb 11, 2014	Midterm	Lab Practical 1 ---Lab Notebooks Due---	-
Feb 13, 2014	Taxonomy & Biology of Phaeophytes (brown algae) Part 1	Overview of Phaeophycean orders Part 1; Field trip at end of lab	GGW pg 472-308 MAC pg 121-277
Feb 18, 2014	Taxonomy & Biology of Phaeophytes Part 2	Overview of Phaeophycean orders Part 2	GGW pg 472-308 MAC pg 121-277
Feb 20, 2014	Phytoplankton Ecology and Blooms: Guest Lecture-Peter Franks	Phytoplankton Lab; free time to work on herbaria	GGW 186-246
Feb 25, 2014	Seagrass & Mangrove Ecology	Seagrass Lab and Intertidal Survey Methods	TBD
Feb 27, 2014	Seaweed Community Ecology & Ecological Interactions	Field Trip: Intertidal surveys of seaweed diversity	GGW pg 547-576
March 4, 2014	San Diego Kelp Forest Ecology: Guest Lecture-Ed Parnell	Set up herbivore grazing experiment	GGW pg 486-546

March 6, 2014	Seaweeds, Human Impacts & Climate Change: Guest Lecture-Maggie Johnson	Set up ocean acidification experiment; Break down grazing experiment; group presentations of results	TBD
March 11, 2014	Drugs from the Sea: Guest Lecture-Bill Gerwick	Papers Due Class Presentations	GGW pg 61-78
March 13, 2014	Algae and Biofuel: Guest Lecture-Greg Mitchell	Lecture Final & Lab Practical -Lab Notebooks Due-	GGW pg 61-78
Finals Week	Herbaria Due	Seaweed Food & Art Celebration	

March 1, 2014	Optional	Field trip to the San Diego Natural History Museum	
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Yellow = good low tide during class
Light Gray = field trip to the intertidal
Dark Gray = exam
Red = Jen gone
Green = Guest Lectures

EXAMS & GRADING:

- Midterm: 10%
- 2 Lab Practicals: 10% each
- Final exam: 15%
- Lab Notebook: 15%
- Research Paper: 15%
- Class Presentation: 5%
- Herbarium specimens: 15%
- Seaweed Food/Art Project: 5%

Lab Notebook: All lab assignments will be recorded in your lab notebook. This will include answers to questions as well as drawings of specimens from the week’s lab. Participation and performance in lab will be evaluated through collection and assessment of the lab notebooks. It is expected that students will keep their notebooks up to date with completion of each of the daily assignments. Notebooks will be collected 2 times during the quarter. Grades will be given based upon clarity and completeness of the daily assignments.

Research Paper: Students will write a 5 page (single spaced) research paper on an alga of their choice. Students should select their algal species (or genus) based upon the alga’s importance from a biological, ecological, economic, societal or cultural perspective. For each paper the student must introduce the basic biology, taxonomy, life history characteristics, anatomy, morphology and ecology of their species (or genus). The paper should also discuss the reasons why this species is of particular importance. Papers should be in essay format fully referenced with literature cited. Graduate students will instead write a 10 page research proposal on a topic of interest related to algae. The proposal should be in

standard National Science Foundation format. Papers for all students are due on March 11, 2014-no exceptions.

Class Presentations: All students are responsible for giving a 5 minute presentation of the information contained in their research paper. Presentations will be in Power Point format and should include information on all of the major components of the paper. Graduate student talks will be 10 minutes and will be an oral presentation of their research proposals.

Herbarium specimens: Students will learn to prepare herbarium specimens of California seaweeds. Herbaria remain the primary way in which phycologists are able to study morphological and taxonomic aspects of seaweeds, as well as identify new species and to catalog species diversity of particular areas over time. Students in SIO 183/283 will prepare their own herbarium collections across the three main taxonomic phyla covered in class. Specimens will be graded for quality (cleanliness, correctness, completeness). Correct spelling is required. We will not accept specimens unworthy of ascension into the SIO herbarium. For full credit, a student's herbarium collection must include the following 25 specimens (parentheses indicate # of specimens per taxonomic group):

1. Chlorophyta: Ulvales/Ulotrichales (1), Cladophorales (1), Caulerpales (1), from any orders (2)
2. Rhodophyta: Bangiales (1), Nemaliales (1), Corallinales (2), Gigartinales (3), Rhodymeniales (1), Ceramiales (2), from any orders (2)
3. Phaeophyceae: Ectocarpales (1), Dictyotales (2), Desmarestiales (1), Laminariales (2), Fucales (2)

If specimens cannot be found in a given taxonomic group, substitutions can be made a rate of 3:1. Students must provide a list (genus and species) of the specimens in their herbarium, and note to which of the required taxonomic groups (or substitutions) they belong. All herbarium specimens must be cleanly and individually mounted on herbarium paper and include a proper herbarium label with all required information. Moldy samples will not be accepted. Student herbaria are due during finals week.

Seaweed Food/Art Project: For the final class meeting we will celebrate the diversity of seaweed by sharing either 1) an edible dish containing seaweed, 2) a piece of artwork made with seaweed or, 3) a seaweed inspired poem or song. As seaweeds have a long history of importance in human societies it seems appropriate to end the quarter with a celebration of the diversity of their uses.

Field trips: We will be taking several MANDATORY field trips around Scripps to view California seaweeds. Two of these field trips will be specifically devoted to sample collection for your class herbarium thus participation is mandatory. If a student cannot make a particular field trip, it is their responsibility to contact me beforehand. If a student misses a field trip it is expected that they will visit the field trip sites on their own time to make appropriate collections.

SUPPLIES TO PURCHASE

Basic dissecting kit

Booties

Field guides

<http://botany.si.edu/projects/algae/introduction.htm>

<http://www.seaweed.ie/algae/seaweeds.html>

<http://www.cryptogamicbotany.com/oa.html>

<http://www.alga-net.com/artwork/artwork8100.html>

HELPFUL WEBSITES:

<http://www.algaebase.org/>

<http://botany.si.edu/projects/algae/prestech.htm>

<http://www.oilgae.com/algae/algae.html>

Name Changes to Marine Algae of California

http://ucjeps.berkeley.edu/californiaseaweeds_refs.html