

SIO 183/283: PHYCOLOGY: Marine Plant Biology

WINTER 2022

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

LAB: 1400-1650, Hubbs Hall 3300

INSTRUCTOR:

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TEACHING ASSISTANTS:

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COLLECTOR:

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GRADING OPTION:

Letter Grade Only

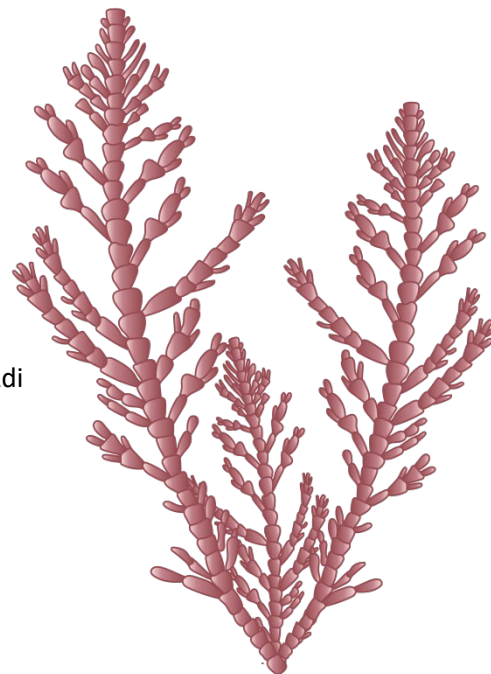
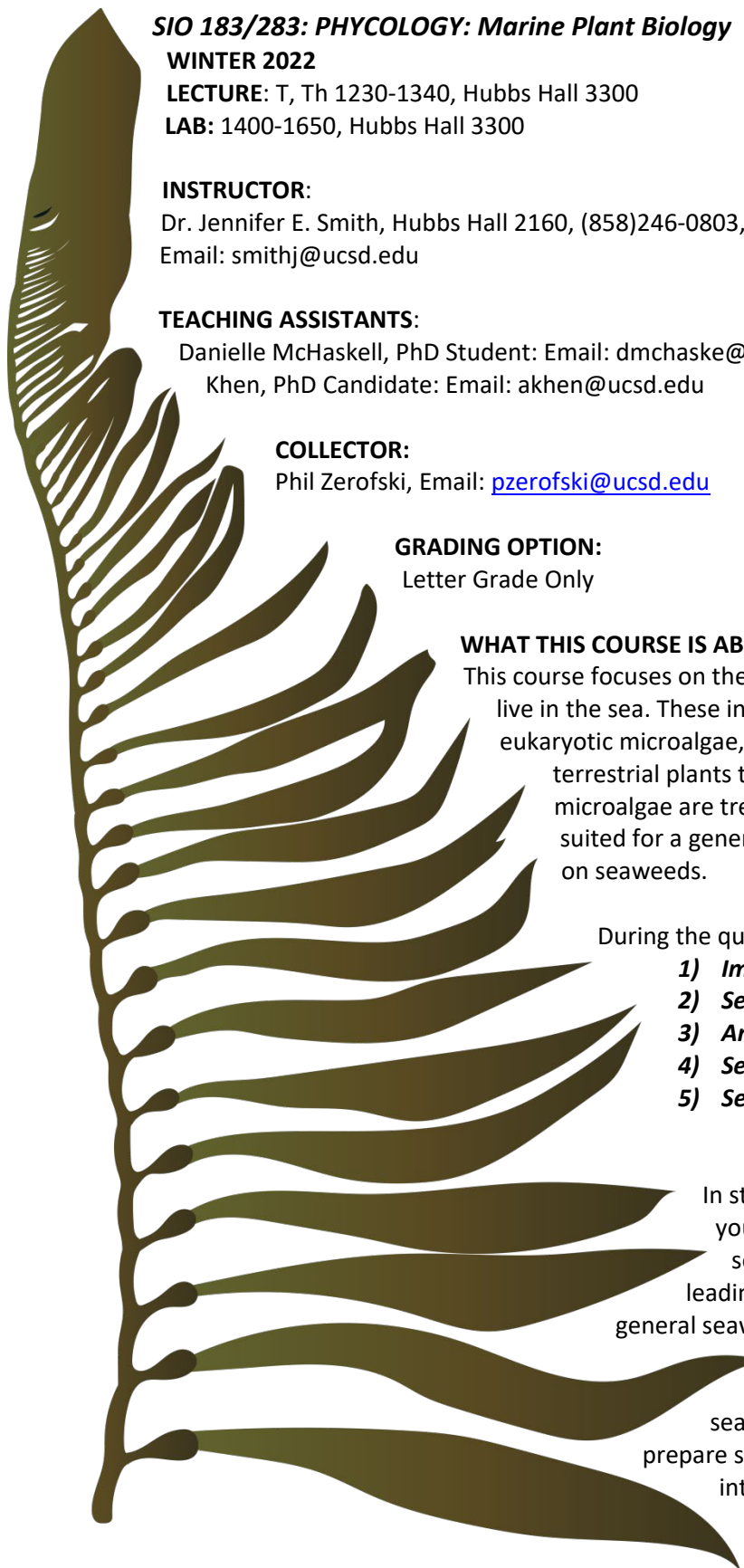
WHAT THIS COURSE IS ABOUT

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) ***Importance of seaweed***
- 2) ***Seaweed diversity, evolution and taxonomy***
- 3) ***Anatomy and morphology***
- 4) ***Seaweed ecology & physiology***
- 5) ***Seaweed uses, 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 on seaweed ecology and/or physiology.



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 (GGW) (2009)* and *Marine Algae of California (MAC), Abbott and Hollenberg (1976)*. Given that *Algae* is out of print we have scanned and uploaded all relevant reading to the course website. I would also recommend *Seaweeds of the Pacific Coast 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)

DATE	LECTURE	LAB	READING	Assignments due
Jan 4, 2022	Introduction to the course and Phycology basics	1.Basic laboratory skills; microscope use and care, herbarium presses	GGW pg 1-16 MAC pg 1-19	Excitement for seaweed! :]
Jan 6, 2022	Diversity of algae	2.Use of taxonomic keys; basic vocabulary for seaweed IDs, slide making; overview	GGW pg 78-93 MAC pg 769-781	
Jan 11, 2022	Taxonomy & Biology of Cyanobacteria	3.Cyanobacterial diversity; possible field trip (-1.02, 5:26)	GGW pg 94-121	Lab 1 and 2
Jan 13, 2022	Taxonomy & Biology of Chlorophytes (green algae) Part 1	4.Overview of green algal classes-green algae Part 1	GGW pg 353-365; 373-403 MAC pg 51-120	
Jan 18, 2022	Taxonomy & Biology of Chlorophytes (green algae) Part 2	5.Focus on Ulvophyceae–green algae Part 2; possible field trip (-1.10, 2:19)	GGW pg 353-365; 373-403 MAC pg 51-120	Lab 3
Jan 20, 2022	Taxonomy & Biology of Rhodophytes (red algae) Part 1	6.Overview of red algal classes and orders Part 1-All; field trip	GGW pg 309-352 MAC 279-744	
Jan 25, 2022	Taxonomy & Biology of Rhodophytes (red algae) Part 2	7.Overview of red algae - Part 2-Floridiophyceae	GGW pg 309-352 MAC 279-744	Lab 4 and 5
Jan 27, 2022	Taxonomy & Biology of Rhodophytes (red algae) Part 3	8.Overview of red algae - Part 3	GGW pg 309-352 MAC 279-744	
Feb 1, 2022	Midterm Review Session	Field trip around SIO, sample collecting and work on herbaria (-1.7, 3:46)— Paper Topics Due		Lab 6, 7, and 8
Feb 3, 2022	Midterm & Lab Practical			

Feb 8, 2022	Taxonomy & Biology of Phaeophytes (brown algae) Part 1	9.Overview of Phaeophyceae orders Part 1	GGW pg 372-408 MAC pg 121-277	
Feb 10, 2022	Taxonomy & Biology of Phaeophytes Part 2	10.Overview of Phaeophyceae orders Part 2; (-0.79, 1:28)	GGW pg 372-408 MAC pg 121-277	
Feb 15, 2022	Ecology: Rocky Intertidal	Field trip-Intertidal Surveys-Dike Rock, collections (-0.9, 3:02)	GGW-547-578; supplemental reading TBD	Labs 9,10, and Paper draft extra credit due
Feb 17, 2022	Ecology: Phytoplankton Ecology and Blooms (Andrew Barton)	Set up herbivore grazing experiment; discuss intertidal data	GGW 547-578; supplemental reading TBD	
Feb 22, 2022	Ecology: San Diego Kelp Forest Ecology (Ed Parnell)	Break down grazing experiment; group presentations of results	GGW pg 486-546; supplemental reading TBD	Group Presentations
Feb 24, 2022	Seaweed Physiology	11.Kelp Physiology Lab	Reading TBD	
March 1, 2022	Algae Drugs from the Sea (Brad Moore)	Class Presentations	GGW pg 61-78; supplemental reading TBD	Paper due, class presentations, and Lab 11
March 3, 2020	Algae and Biofuel: Guest Lecture-Stephen Mayfield	Finish presentations & Final Field trip to work on herbarium collections; Herbarium Checklist	GGW pg 61-78; supplemental reading TBD	Class presentations
March 8, 2022	Seaweeds & Sustainability	Study Session & Open Lab		
March 10, 2022	Final Exam	Lecture Final & Lab Practical		
FINALS WEEK: Tues, March 15, 2022, 11:30-2:00	Herbaria Due	Celebration of Seaweed in Human Societies: Arts, Food & Culture		Seaweed projects to share with the class!

Key to the Syllabus:

Yellow = good low tide during class

Light Gray = field trip to the intertidal

Dark Gray = exam

Green = Guest Lectures

Blue = Holiday

EXAMS & GRADING:

Midterm: 10%

1 Lab Practical: 10% each

Final exam: 25%

Lab Notebook: 15%

Research Paper: 15%

Class Presentation: 5%

Herbarium specimens: 15%

Celebration of 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. You will keep your notebook with you throughout the quarter. To grade notebooks, the teaching assistant will collect digital copies (i.e. take a photo) of your lab notebook so make sure that it is neat and legible! 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 (including references) 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. Please include separate sections for each of the above-mentioned topics. Papers should be in essay format fully referenced with literature cited (at least 5 references). Students may wish to use figures, pictures or other illustrations. ****Students can receive extra credit if they turn in an early draft of their paper by Feb 15. This draft should include a thorough outline of all paragraphs fleshing out the main points of your paper for the purposes of getting feedback on the paper before final drafts are due.*

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. Practice your talks and make sure that you can get through them in 5 min.

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 order (2)
2. Rhodophyta: Bangiales (1), Corallinales (2), Gigartinales (3), Rhodymeniales (1), Ceramiales (2), from any order (3)
3. Phaeophyceae: Ectocarpales (1), Dictyotaales (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.

*****Make sure to include a table of contents for your samples indicating which samples are being used for the assignment. Don't forget an herbarium label for each of your samples. Finally! Make sure you check Algaebase to get the most currently accepted name for your specimen.***

Celebration of Seaweed Project: For the final class meeting we will celebrate the diversity of uses of seaweed in human society by sharing either 1) an edible dish containing seaweed, 2) a piece of artwork made with seaweed or, 3) a seaweed inspired performance (poetry, music, dance). 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. Points will be awarded based on creativity (for example, please do not buy sushi or seaweed snacks).

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. Appropriate clothing and footwear is also required (no bare feet allowed).

SUPPLIES TO PURCHASE

Booties or other water shoes (highly recommended), otherwise closed toe shoes such as old tennis shoes will be required for the field trips
Seaweed/Marine Organism Field guides (recommended)

HELPFUL WEBSITES:

<http://www.algaebase.org/>
<http://botany.si.edu/projects/algae/prestech.htm>
<http://www.oilgae.com/algae/algae.html>
<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>
<http://sdplantatlas.org/AlgaSelector.aspx>
<https://macroalgae.org/portal/index.php>

Name Changes to Marine Algae of California

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