EVPP 441/505 PROTIST DIVERSITY AND ECOLOGY LAB

Spring 2025

Welcome to Protist Lab! This is a required part of the Protist course. In this portion of the course, you will be an aquatic scientist who explores the freshwater environment and protist diversity, based on materials that we provide you in lab and on your own field and laboratory samples. We hope that you will find the World of Protists as fascinating as we do!

Throughout the course we will explore the diversity and ecology of most common freshwater and marine protists (eukaryotic algae and protozoa) and cyanobacteria by investigating living specimens with microscopes and watching video material when needed. You will do labeled sketches and photographs in an electronic lab journal which you will turn in at the end of the class. The journal will contain entries for known specimens that we furnish in class and also unknown specimens that you bring into lab over the semester. The intent of learning the aquatic biological diversity is to prepare you for your own identifications and quantifications of aquatic organisms which you collect from local freshwater habitats. We also will learn how algae are used as indicators of ecological conditions in freshwater ecosystems. The course concludes with an illustrated powerpoint presentation based on your work.

This lab is based on a collaborative approach to learning: you will work in pairs or threes to explore and develop understanding of course concepts and support each other's learning. You will actively engage one another to increase your comprehension. The creation of a **Lab Journal by each student** will be a very important part of the course. For each lab you will enter your findings in a virtual or electronic Lab Journal.

Lab Journal Guidelines: As stated above, the Lab Journal is the primary way that you communicate what you have done and what you have learned to the Instructor. Following the first lab and at two other points in the semester (1/3 of the way through and final version), your Lab Journal will be submitted to the instructor. It is very important that your Lab Journal is comprehensive, complete, and structured properly to demonstrate that you have been thorough in your pursuit of the lab objectives. The maintenance of the Lab Journal will be used to assess the depth and comprehensiveness of your work. Each week a sheet will be provided which will indicate what instructor-provided materials should be added to the lab Journal for that week.

In addition, you will add a minimum of 15 genera that you collected or found in field samples brought to the lab and not included in the required list.

The structure for the **Lab Journal** is as follows:

- The basic format of the Lab Journal will be a Microsoft WORD document.

- There will be a title page that includes the Course number (different for grad vs. undergrad students) and Title, the semester taken, the author's name
- There will be a Table of Contents which at a minimum lists each week's lab as a separate chapter
- For each week's lab chapter you will be provided with list of all genera to learn, organized in systematical order.
    - For each genus develop a page, including:
        - Sample location and type, sampling and photograph date
        - Scientific genus name
        - Biosystematics hierarchy (available at ttps://www.algaebase.org/)
        - Photograph taken with your cell phone through the microscope objective (or better yet, by the microscope camera set of in the lab) embedded within the WORD file
        - Sketch which interprets the structures seen in the photograph* also embedded within the WORD file, with information on the size of the specimen or magnification of any drawing
        - Morphology: type, distinctive cellular or reproductive features observed*
    - Other information as assigned by the instructor

    * For definition of structures see references at the end of the lab syllabus

Your Lab Journal entry for the first lab date January 24 should be submitted in the appropriate place on the class Blackboard site by Monday January 27 so that the Instructor may make sure that you are on the right track.

Lab Instructor:
Dr. R. C. Jones (Dr.J)
rcjones@gmu.edu
703-655-0379 (cell) if you text please identify yourself
3114 Potomac Science Center
Available by appointment in the office or by phone

Hannah Toney
Graduate Teaching Assistant
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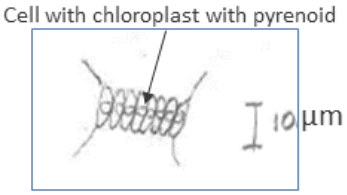
Sample Lab Journal Entry:

Entry # 1
Location: Gunston Cove, Station 7
Type of Sample: Plankton
Date of Sample: 8/29/202
Date of Photograph: 8/30/2022
Genus: *Desmodesmus*
Phylum: Chlorophyta
Class: Chlorophyceae
Order: Sphaeropleales
Family: Scenedesmaceae



Morphology: Distinctive features 2 to 8 celled colonies with ellipsoidal cells arranged side by side. Each cell contains chloroplast with pyrenoid. Two spines projecting from each terminal cell. Reproduces by autocolony formation.

Type of Sample could be: Culture, Plankton, Epilithic, Epiphytic, Epipelic, Other (specify)

Course Topics and Schedule: Laboratory. Unless otherwise noted, we will meet in **L005 PSC**.

WEEK 1: January 24
Give an overview of the lab. Present syllabus and grading including additional requirement for graduate credit. Course requirement for a lab notebook (see above). How to use microscopes and calibrate ocular micrometer. Learn how to use projection microscope and take pictures. Brief presentation overviewing terms used phycology keys. Observe and identify algae from cultures and field samples with emphasis on morphological features. Learn resources available for defining morphological terms and full biosystematics of identified genera.

WEEK 2: January 31
Cyanobacteria: Observe and identify cyanobacteria from cultures and field samples with emphasis on reproductive and morphological features.
• Lab Journal Submission

WEEK 3: February 7
Red Algae: Structure and Diversity. **And Green Algae Part II**: Structure and Diversity. Streptophytes: Zygnematophyceae, Coleochaetophyceae, Charaphyceae:
-from cultures, preserved specimens and prepared slides.

WEEK 4: February 14
Green Algae Part I: Structure and Diversity. Ulvophyceae, Treboxiophyceae: Chlorophyceans (including Volvocales, Oedogoniales, Chaetophorales) Structure and Diversity. From cultures, preserved specimens and prepared slides.

WEEK 5: February 21
Bacillariophytes (diatoms) from cultures, preserved specimens and nature.

WEEK 6: February 28
Chrysophyceans, Synurophyceans, Eustigmatophyceans, Dictyochophyceans, and Xanthophyceans: Structure and Diversity. From cultures, preserved specimens and prepared slides.

WEEK 7: March 7
Brown algae, Euglenoids, Dinoflagellates, Cryptophytes: from cultures, preserved specimens and prepared slides
• Lab Journal Submission

WEEK 8: March 14
SPRING BREAK

WEEK 9: March 21
Field trip to a local stream. Work in groups of 2 or 3. Collect epilithic algae and any filamentous mats. Learn field water quality measurement., flow velocity, Quantitative sampling including measuring chlorophyll a and AFDW sampling.

WEEK 10: March 28
Process stream samples in Lab. Identify algae and add to Laboratory Journal. Chlorophyll a, AFDW and phycocyanin measurement**.**

WEEK 11: April 4
Field trip to a local wetland/pond. Repeat procedures for stream field trip (except no quantitative sampling) working in groups of 2 or 3.

WEEK 12: April 11
Process samples from wetland/pond field trip as was done for stream field trip.

WEEK 13: April 18
Guest Speaker: Dr. *Dr. Michael Paul, EPA National HAB Program Lead*
Start **Protozans: Ciliates and Amoebae.** from cultures, preserved specimens and prepared slides

WEEK 14: April 25
Wrap up Protozoans and any work not completed and start on presentations.

WEEK 15: May 2
Presentations and Poster Session

Course Assessment

• **Lab Journal (70 pts.)**

• **Individual Poster presentation summarizing data in Lab Journal: Drawings and Photos or representative species. Statistics on number of species described by taxonomic group and by habitat. (15 pts)**

• **Oral Group Presentation on findings from Field Sampling (15 pts).**

Additional work for Graduate Students:
Grad students (those enrolled in EVPP 505 should pick a genus of algae that they have described and write a 10 page paper on the ecology and biosystematics of that genus using at least 10 literature sources. This paper will be worth an additional 20 pts so Grad Students will have 120 pts possible, but their score will be tallied on a percentage basis.

Identification books for the lab
Wehr, J. D., Sheath, R. G. & Kociolek, P. 2015. Freshwater Algae of North America: Ecology and Classification. Academic Press, San Diego, 2nd Edition. Copy in the lab.

Patterson, D. J. & Hedley, S. (1996) Free-living Freshwater Protozoa. A Colour Guide. Manson Publishing. Copy in the lab.

Graham, L.E., J.M. Graham, L.W. Wilcox, and M.E. Cook. 2022. Algae. (4th Ed.). Download of pdf ebook available at https://www.ljlmpress.com/algae.html for $40. Beautiful illustrations and very readable.

On-line identification resources for the lab

Diatoms: https://diatoms.org/glossary
Soft-bodied algae: Soft Algae Glossary by Stancheva et al. 2016 in Lab Blackboard site.
AlgaeBase: https://www.algaebase.org/
AlgaeBase Searchable Glossary: https://www.algaebase.org/search/glossary/
AlgaeBase Genus Search: https://www.algaebase.org/search/genus/ for complete biosystematics

Sources of Protists and Cyanobacteria
ATCC (American Type Culture Collection). https://www.atcc.org/microbe-products/protistology#t=productTab&numberOfResults=24
Carolina Biological Supply
UTEX culture collection of algae: https://utex.org/collections/living-algal-strains
Algal Resources Collection, UNC-Wilmington:
https://www.algalresourcescollection.com/strains
Center for Applied Aquatic Ecology, NC State. https://caae.cals.ncsu.edu/research/research-labs/algal-culture-and-microbiology-laboratory/