LIMNOLOGY
ESR 475/575
Fall 2009

This course is a survey of limnology, focusing on the physical, chemical, and biological characteristics of freshwater, lentic systems. Students will learn how these characteristics interact and change with depth and season. Students will become familiar with commonly used limnological terminology and methods and understand how human activities influence lake systems.

Instructor: Mark Sytsma (218 SB2)
Office hours: by appointment
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Textbook: Limnology (Kalff, 2002)

Course information and announcements will be on myPSU Course Studio.
To access this information you must sign up for myPSU
http://computing.pdx.edu/node/48 to use OAM (Odin Account Manager)
Then logon to myPSU here: https://my.pdx.edu/cp/home/displaylogin

Lecture: MWF 10:00-11:50, CH 158
Guest Lecture: Oct. 14: Mark Rosenkranz, Lake Oswego Corporation
Oct. 21: Rich Miller, Siltcoos Lake research
Nov 16: Dr. Richard Petersen
Field Trip: Oswego Lake – Oct. 17

Midterm exam: November 4

Review primary literature requirement for undergraduate credit
Read and write a one-page summary of 2 papers from the primary literature in Limnology, i.e., journals such as *Limnology and Oceanography*, *Limnology*, *Aquatic Botany*, *Archiv für Hydrobiologie*, etc.
Turn in the the first summary along with a copy of the paper being reviewed on November 9 and the second one on November 23

Paper and presentation requirements for graduate credit
Graduate student must write a 4-page, double-spaced paper on a limnological subject of their choosing. The paper must include at least 5 citations of recent literature (last 5 years). I suggest narrowing your topic sufficiently to be able to provide a relatively comprehensive review of the literature in 4 pages. A 15-minute presentation must also be made. **The paper is due on November 18.** This draft will be distributed to other graduate students for peer-review (this will be a double blind review – you will not know who reviewed your paper and you will not know who's paper you are reviewing). Reviewed papers must be returned on **November 23**. Revised papers must be turned in, along with a copy of the first draft, the reviewers comments, a description of how you addressed the comments, and an evaluation of the helpfulness of the comments, on **November 30**. **Presentations will begin on November 18**.

Final Exam: Wednesday, December 9 at 8:00 AM.
Final exam will be cumulative

Grading
Undergraduates: Midterm 40%, Final 50%, literature reviews 10%
Graduate students: Midterm 30%, Final 35%, peer-review of paper 5%, paper 15%, presentation 15%

Grades will be assigned as follows: $\geq$ 96%=A, $\geq$ 90%=A-, $\geq$ 87%=B+, $\geq$ 83%=B, $\geq$ 80%=B-, $\geq$ 75%=C+, $\geq$ 70%=C, $\geq$ 65%=C-, $\geq$ 60%=D+, $\geq$ 55%=D, $\geq$ 50%=D-, < 50%=F

COURSE OUTLINE

Introduction to the course and a bit of history

Pathbreaking limnology, why limnology is important (Chapters 2 and 4)

Lake morphology and morphometry (Chapters 6 and 7)

Geological processes responsible for formation of lake basins, morphology of lake basins, lake morphometry (bathymetric maps, average depth, volume, relative depth, development of volume and area), relationships between origin of lake basins and lake morphology.

Properties of water (Chapter 3)

Structure of the water molecule, structure of liquid water, importance of hydrogen bonds, temperature-density relationships, specific heat, viscosity, dielectric constant.

Light and Heat (Chapters 10 and 11)

Water transparency, spectral properties of light absorption, color of lakes, annual patterns of heat gain and loss, temperature stratification.

Water movement (Chapter 12)

Currents, waves, seiches, turbulence, stability of stratification, indices of mixing.

Watershed-Lake interactions (Chapters 8 and 9)

Watershed and water budget, source of common ions (calcium, magnesium, sodium, potassium, chloride, bicarbonate and sulfate), alkalinity-pH relationships, inorganic carbon.

Oxygen (Chapter 15)

Oxygen solubility as a function of temperature and pressure, influence of oxidation-reduction processes, plant growth and primary productivity, oxygen budgets, oxygen concentration vs. depth in stratified lakes.

Redox processes (Chapter 16)

Important chemical participants in oxidation-reduction (redox) processes: carbon, sulfur, iron, nitrogen, manganese. Microbes influencing redox processes.

Primary Productivity and Nutrient cycles (Chapters 17, 18, 19, 20)

Measurement of primary productivity. Factors controlling primary productivity. Chemical and biological transformations of common plant nutrients: nitrogen, phosphorus, silica. Sources of plant nutrients, nutrients as controls of lake ecology.

Phytoplankton (Chapter 21)

Species composition of the phytoplankton, annual patterns of species succession and abundance, chemical and physical factors influencing species composition.

Bacteria, Zooplankton, benthos, fish (Chapters 22, 23, 25, 26)

Species composition of the zooplankton, annual patterns of species succession and abundance, vertical migration, cyclomorphosis.

Macrophytes (Chapter 24)

Macrophytes: species composition, distribution and patterns of productivity, introduced species, management.

Lake ontogeny (Chapter 28,)

Natural processes influencing lake development, human influence on lake processes and lake management, paleolimnology.