

Environmental Enzymology

CPSC 499

Spring 2019

2 credit hours

Instructor: Andrew Margenot (margenot@illinois.edu, 217-300-7059, PSL 1011)

Discussions: Friday, 1:00-2:50

Overview:

Transformation of nutrient elements (C, N, P, S) in terrestrial systems is catalyzed by extracellular enzymes. The extracellular nature of these enzymes raises implications for nutrient fluxes from pedon to global scales, while simultaneously challenging their study. This seminar will examine advances in how extracellular enzymes in environmental samples are measured and conceptualized to enhance our understanding of biogeochemical processes that govern the fluxes and fate of nutrient elements. We will examine and synthesize the rapidly evolving scientific literature on extracellular enzymes in environmental samples. Emphasis will be given to (i) novel methods of environmental enzyme assays, (ii) hypotheses on fundamental controls of extracellular enzymes and (iii) interdisciplinary work drawing on approaches and perspectives from traditional biochemistry. This includes methodological challenges unique to environmental samples such as soils and sediments, distinguishing among multiple enzyme sources in complex environmental samples, characterizing enzyme kinetics, and linking enzyme activity with biochemical and microbiological processes.

Expectations Grades are S/U. To pass, you are expected to 1) attend to and actively participate in a minimum of 13 of 14 sessions during the semester and send an email to the instructor/facilitator when you cannot attend, 2) prepare and participate in seminar discussions, in particular performing the required readings, and 3) presenting and leading a discussion based on a topic.

Topics

Week	Meeting Date	Topic	Student-led Discussion
1	Jan 18	Principles of enzymology	n/a
2	Jan 25	<i>No class</i>	-
3	Feb 1	How and where are enzymes in terrestrial environments?	n/a
4	Feb 8	Methodology I	n/a
5	Feb 15	Methodology II	n/a
6	Feb 22	Spatiotemporal dynamics	
7	Mar 1	Big ideas: Enzymes in ecology and biogeochemistry	
8	Mar 8	Stoichiometry: Redfield ratio for enzymes?	
9	Mar 15	Walker-Syers Model and phosphatases: a case study of enzymes in biogeochemistry	
10	Mar 22	<i>No class (Spring Break)</i>	-
11	Mar 29	Enzymes in nutrient cycling	
12	Apr 5	Linking enzymes and microbial communities	
13	Apr 12	Environmental pollution and remediation	
14	Apr 19	Climate change	
15	Apr 26	Toward an environmental enzymology	n/a
16	May 3	Finals	-

Required and Suggested Reading Papers that are instructive to the topic will be required reading, and papers with relevant supporting information will be identified for those interesting. Papers will be posted online at least 1 week before the class.

Student-Led Discussions Each student will lead a 30 min presentation + discussion session on the week topic that is focused on the primary literature. Presentations should **identify** an application, challenge or knowledge gap, **synthesize** outcomes of scientific approaches to address this, and **propose** next steps for the research field. This last step will form the basis for the student-led discussion. A presentation outline and scientific papers is due to the instructor 1 week before the scheduled presentation date. Students are encouraged to meet with the instructor one-on-one in advance to discuss their presentation.

Student-Led Discussions Grading (letter system) will be based on attendance (20%), class participation (30%), and the presentation + discussion led by the student (50%).