Biol 645: Theory and Principles in Ecology, Fall 2009 (3 units)
Lectures: MW 10:00-10:50am, LS 132
Discussion: W 11:00-11:50pm LS132

Instructors:

Brian Hentschel: PS 147, hentsche@sciences.sdsu.edu, by appointment (via email)

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Course description

Biol 645 is the first of two graduate core courses for the Ecology Program Area. The purpose of the courses (645 & 745) is to provide all graduate students with a solid foundation in the fundamental concepts and principles of Ecology. Course material will integrate key historical and modern papers in Ecology with more current applications as a way of providing perspective on many of the current debates and paradigms in Ecology. Although both core courses will cover basics of ecology, the focus will be on critical thinking, analysis, presentation and discussion.

Course objectives

The key objectives of Biol 645 are to:

- introduce students to foundational concepts and seminal papers in ecology
- promote critical thinking and discussion
- demonstrate current applications of foundational concepts in ecology
- involve students in leading and facilitating discussion
- promote responsible and constructive peer-reviewing skills
- develop scientific writing (review papers and grant/thesis proposals)

Learning outcomes

At the completion of this course, students will be able to:

- Identify and explain foundational concepts in population, physiological, behavioral ecology
- Recognize multiple representations (e.g. models) and their application to those major concepts in ecology
- Link and give examples of historical and current research (paradigms, methods, experimental design, hypotheses)
- Communicate information effectively orally and in writing about fundamental concepts in population, physiological, behavioral ecology
- Formulate a scientific argument and support it with appropriate evidence from scientific literature
- Demonstrate the ability to critique scientific articles professionally
- Demonstrate the ability to develop, revise, and evaluate a research proposal
- Select and apply knowledge (paradigms, experimental design, hypotheses) from relevant literature to personal research interests and objectives

Expectations for Discussion

All students are expected to arrive each week prepared to participate in active and informed discussion. Discussion participation is an important component of your grade.

Each week there will be one discussion **Reviewer** and a discussion **Facilitator**. The role of the discussion **Reviewer** is to provide the context and set the stage for the discussion. To do this, the **Reviewer** will be expected to give a clear synopsis of the papers, and a brief history or background of the topic, as well as how it relates to recent lecture topics. Weekly required readings will pair a classical paper in Ecology with a more recent paper that demonstrates a current application or interpretation. The job of the **Reviewer** will be to cover the key topics from both the classical and the recent paper, demonstrating the connection between the two. Aim for the review to be between 3-5 mins, not much longer. Five minutes before the end of discussion, the reviewer will summarize the take home messages and conclusions of the discussion. After the discussion, the **Reviewer** should post a document (outline, summary) of the material covered on the discussion board. Students typically use these plus their own notes as a study guide.

The role of the **Facilitator** is to keep the discussion lively and inclusive. Have a list of thought provoking questions ready to stir up the crowd; that means open ended questions designed to engage discussion participants. The **Facilitator** is in charge of encouraging quiet students to engage, even if they do not volunteer, and working to keep the contributions balanced among the participants.

Course format

2 weekly lectures (50 mins).
1 weekly discussion (50 mins). Each discussion will pair a classic paper in ecology (from *Foundations in Ecology* and other key papers) with a more current application/publication. Each student will be required to lead and facilitate at least 1 discussion throughout the semester.

Contents/topics

As the purpose of this course is to introduce students to fundamental concepts in Ecology, Biol 645 centers on the following five subfields within Ecology: population ecology, interspecies interactions, behavioral ecology, ecophysiology, and genetics and evolution.

Assignments & Grading

Students will be assigned and graded on the following
1) Two writing assignments – literature review (4-5 pgs) and grant proposal (7-8 pgs)
2) Three formal peer reviews of grant proposals
3) Discussion reviewer (at least once/semester)
4) Discussion facilitator (at least once/semester)
5) Written final exam (short essay/essay question format, for JDPE students, this will count towards qualifying exams)

Course materials

For lectures and discussions, students will be assigned primary literature & *Foundations in Ecology* papers to read. These will be posted on Blackboard. For students who need more background material, there is a supplemental list of references that can provide context and introductions to fundamental concepts.

Study questions and study groups

Study questions are intended to help emphasize key concepts covered in lectures and to serve as a guide to help you study for the final exam. We will post study questions on Blackboard approximately every two weeks. We strongly recommend that students create study groups of approximately 4 people to review lecture material and collaborate on answers to the study questions.

Writing assignment

The aims of the writing assignments are to help you develop skills exploring primary literature, synthesizing information from disparate sources, critically evaluate research and developing your own research project. The first assignment will be a literature review in your area of interest/research. The second assignment will be a grant proposal which builds on the literature review, presents research questions and develops methods to address these questions. The grant proposal will go through two stages. In Stage 1, everyone in the class will submit a polished draft (we'll talk more about what this means) for a formal review by three classmates. You will then revise your proposal to incorporate peer comments and resubmit the manuscript for final review by the instructors. Papers will be graded based on how well you present the scientific context, current knowledge and your project within that context. We expect both assignments to be written with articulate, concise language.

State Budget Cuts Cause Faculty Furloughs

The California State University (CSU) defines a "furlough" as "a mandated period of time off without pay." As a result of devastating California state budget cuts, faculty and staff at SDSU are prohibited from working on two days per month (and a total of 4 days in one single month) during the 2009-10 academic year.

The faculty furlough plan prohibits professors from teaching, being on campus, and consulting with students during furlough days. Exact dates designated as "furlough days" vary from person to person. During the Fall 2009 semester, the fulough days of Biol 645 faculty are the following:

Dr. Hentschel: Sep 8, 29; Oct 13, 14, 15, 16; Nov 4, 16; Dec 8, 23
Dr. Hovel: Sep 18, Sep 24; Oct 16, Oct 30; Nov 3, Nov 16; Dec 11, Dec 18.
Dr. Lewison: Sep 18, Sep 22; Oct 12, Oct 19; Nov 18, Nov 25; Dec 3, Dec 18

On those days, classes and office hours are cancelled, and telephone and e-mail messages will not be answered until the following day.

In addition, students should be aware that the staff furlough causes most University offices to close on the following days: Sep 11, 18; Oct 2, 16; Nov 13, 25; Dec 21-24.

LECTURE AND DISCUSSION SCHEDULE

FOE = Foundations of Ecology

* = *study questions posted on Blackboard* *TBP = To Be Posted on Blackboard*

Date	D	Topic	Lecturer
8/31	M	Course introduction	
9/2	W	Ecology of populations: population processes & life cycles Reading: Sibly & Hone 2002	Lewison
9/2	W	**DISCUSSION** Population process & regulation R1: **Sheila** F1: **Kate** Reading: Nicholson & Bailey (1935) in FOE; Sinclair & Krebs 2002	Lewison
9/7	M	**LABOR DAY – NO CLASS**	
9/9	W	Ecology of populations: population regulation Reading: Carrete et al. 2008	Lewison
9/9*	W	**DISCUSSION** Population models R1: **Ryan** F1: **Stephaney** Reading: May (1974) in FOE; Reed et al. 2002	Hentschel
9/14	M	Modelling single population growth; continuous models Reading: Turchin chapter	Deutschman
9/16	W	Modelling single population growth: discrete models Reading: Turchin chapter	Deutschman
9/16	W	**DISCUSSION** Structured populations R1: **Sarah** F1: **Josh** Reading: Paine (1966) in FOE: Lytle & Merritt (2004)	Hentschel
9/21	M	Structured populations: life history theory Reading: Stearns 2000	Lewison
9/23	W	Modelling structured populations Reading: Deines et al 2007	Lewison
9/23*	W	**DISCUSSION** Competition as a structuring force R1: **Kim** F1: **Sarah** Reading: Park (1948) in FOE; Kerr et al. 2002	Hovel
9/28	M	Biotic interactions: competition Reading: Gurevitch 1986	Hovel
9/30	W	Biotic interactions: predation Reading: Real 1979	Hovel
9/30	W	**DISCUSSION:** Biotic interactions R1**: Brenna** F1: **Renee** Reading: Connell (1961) in FOE; Olson et al. 1995	Hovel
10/5	M	Biotic interactions: other 'isms' and 'tions' (facilitation, parasitism, mutualism, symbiosis) Reading: Douglas 2008	Hovel
10/7	W	Biotic interactions: other 'isms' and 'tions' (facilitation, parasitism, mutualism, symbiosis) Reading: TBA	Hovel
10/7*	W	**DISCUSSION:** Biotic interactions R1**: Renee** F1: **Spencer** Reading: Kiers et al. 2003	Hovel

10/12	M	Modelling populations with spatial structure Reading:Thomas & Kunin (1999)	Hovel
10/14	W	Spatial structure in populations Reading: Huffaker (1958) FOE	Hovel
10/14	W	**DISCUSSION** Spatial structure & fragmentation R1: **Josh** F1: **Yareli** Reading: Huffaker (1958) FOE; Bender & Fahrig 2005	Hovel
10/19	M	Behavioral ecology Reading: Emlen & Oring (1977)	Clark
10/21	W	Behavioral ecology Reading: Andersson & Simmons (2006)	Clark
10/21 *	W	**DISCUSSION** Behavioral ecology R1: **Stephaney** F1: **Sheila** R2: **Kate** F2: **Julie** Reading: Schoener (1971) in FOE; Parker & Smith (1990) Gould & Lewontin 1979	Lewison
10/21		**LITERATURE REVIEW **DUE****	
10/26	M	Modelling behaviors Reading: NA	Lewison
10/28	W	Intro to Physiological Ecology Readings: Costa & Sinervo (2004), Ernest et al. (2003)	Hentschel
10/28	W	**DISCUSSION** Applying principles of physiological ecology to predict effects of climate change R1: **Andrea** F1: **Ryan** Reading: Helmuth et al. (2005)	Hentschel
11/2	M	Animal Ecophysiology Readings: Romero (2004), Dahlhoff (2004)	Hentschel
11/4	W	Animal Ecophysiology: Adaptations to extreme environments Reading: Fritsches et al 2005	Lewison
11/4*	W	**DISCUSSION** Animal Ecophysiology R1: **Spencer** F1: **Brenna** Reading: Porter & Gates (1969) in FOE; Davies et al 2006	Lewison
11/9	M	Ecophysiology & resource acquisition Readings: Elser et al. (2003), Clarholm 1989	Hentschel
11/11	W	**VETERANS DAY – NO CLASS**	
11/16	M	Plant Ecophysiology: Adaptations to extreme environments Reading: McCulley et al. 2004	Lipson
11/18	W	Plant Ecophyslogy – leaf & canopy Reading: Wright et al. 2004	Lai
11/18 *	W	**DISCUSSION** Plant Ecophysiology R1: **Yareli** F1: **Andrea** Readings: Valladares et al (2000),Ehleringer & Dawson (1992)	Hentschel
11/23	M	Additional biological responses to physical environment Readings: TBA	Hentschel
11/23		**GRANT PROPOSALS **DUE** FOR PEER REVIEW**	
11/25	W	**NO CLASS**	

11/25	W	**NO CLASS**	
11/30	M	Introduction to population genetics Reading: Halliburton Ch. 1	Bohonak
12/2	W	Empirical population genetic data analysis Reading: Viaud-Martinez et al 2007	Bohonak
12/2	W	**DISCUSSION** Conservation genetics R1: **Brad** F1: **Kim** Reading: Viaud-Martinez et al 2007; Riley et al. 2006	Lewison
12/2		**PEER REVIEWS OF GRANT PROPOSAL **DUE****	
12/7	M	Macro-evolutionary processes Reading: Bofarull et al 2008	Reeder
12/9	W	Macro-evolutionary patterns: IBT, biogeography Reading: Brown & Maurer (1989)	Hentschel
12/9*	W	**DISCUSSION** Macro-evolution: process & pattern R1: **Julie** F1: **Brad** Reading: Simberloff & Wilson (1969) in FOE; Finkel et al. (2005)	Hentschel
12/15		**FINAL GRANT PROPOSAL **DUE****	