# PHYSIOLOGICAL ECOLOGY (BIO 31): SPRING 2013
## Course description and grading policy

**Instructor:** Matt Ayres (LSC 125, 6-2788).
Office hours: Monday and Thursday 16:00-17:00 or by arrangement.

**Laboratory Coordinator:** Craig Layne

**Graduate Assistant:** Nina Lany. Office hours to be arranged

**Textbooks to purchase:** Willmer, P., G. Stone, G. & I.A. Johnston. 2004. Environmental Physiology of Animals. Edition 2. Blackwell Science. ISBN-10:1405107243
Heinrich, B. 2003. Winter World: The Ingenuity of Animal Survival. Harper-Collins.

**Textbook on reserve:** Lambers, H, FS Chapin, III, and TL Pons. 1998. Plant Physiological Ecology. Springer -Verlag.

**Meeting times:** Lecture: Tuesday and Thursday 10:00-11:50 (10A) in LSC 105
Laboratory: Mon or Tues 14:00-18:00 in LSC 104 (starting 1 April). Overnight field trip to Second College Grant on 2nd weekend (6-7 Apr; recommended but not required; departing early Saturday, returning late aft Sunday).

**Course website:** www.dartmouth.edu/~bio31; some materials will also be posted on Blackboard.

**Course overview:** What factors determine the distribution and abundance of organisms? This course is an exploration of environmental effects on fundamental physiological processes in plants and animals. Abiotic factors such as temperature and water availability interact with biotic forces such as predation, herbivory, and competition to constrain the ability of organisms to survive, grow, and reproduce. Physiological solutions that allow success in one environment may preclude it in another. This course seeks to build up from physiological principles to understand characteristics of populations, communities, and ecosystems. Prerequisite: at least one of Biol 12-16.

**Grading policy:** Grading will be based on two midterm examinations, a comprehensive final exam, and laboratory activities (including an independent research project). Note that midterm exams are on the evenings of 18 April and 14 May at 19:00. Late exams will not be given except under extraordinary circumstances that are discussed with the professor by phone or in person prior to the exam. Late laboratory assignments will be penalized 10% per day up to a maximum of 30% penalty. I encourage students with disabilities of any kind to discuss them with me so that appropriate accommodations can be made.

**Overall grading allocation for course**

| Item | % |
|---|---|
| 1st midterm | 20 |
| 2nd midterm | 20 |
| Final exam | 30 |
| Laboratory | 30 |
| Total | 100 |

**Grading allocation for laboratory component**

| Lab activities | Points |
|---|---|
| Research questions from trip to 2nd Grant | 10 |
| Hypothesis generation exercise | 10 |
| RP-1: Insect growth and metabolism | 20 |
| Modeling exercise | 10 |
| RP-2: Plant physiological ecology | 20 |
| Literature critique #1 | 10 |
| Literature critique #2 | 10 |
| Literature critique #3 | 10 |
| Student Initiated Research Project proposal | 10 |
| Student Initiated Research Project | 40 |

# Physiological Ecology (Bio 31): Syllabus and Lab Schedule for Spring 2013

| Lecture Topic | Text Reading[a, b] |
|---|---|
| History, domain, and approaches of physiological ecology | H Ch 1-10; WSJ Ch 1-2 |
| Animal Physiological Ecology | H Ch 11-20 |
| Primary metabolism | WSJ Ch 3, 6 |
| Acquisition of energy and nutrients | WSJ 13, 15 |
| **FIRST MIDTERM EXAM** (18 April at 19:00 ) | |
| Environmental challenges | |
| • Temperature | WSJ Ch 8, 16 |
| • Gas relations | WSJ Ch 7; H Ch 21-25 |
| • Water availability | WSJ Ch 4-5 |
| • Toxins and anthropogenic effects | WSJ 11, 12, 14 |
| Communication | WSJ 9 |
| Plant Physiological Ecology | |
| Primary metabolism | L Ch 2b, 2c |
| Acquisition of energy and nutrients | L Ch 2a, 6 |
| Environmental challenges | |
| • Temperature | L Ch 4a, 4b |
| • Gas relations | L Ch 5 |
| • Water availability | L Ch 3 |
| **SECOND MIDTERM EXAM** (14 May at 19:00) | |
| • Toxins and anthropogenic effects | |
| Growth and resource allocation | L Ch 7 |
| Future of Physiological Ecology | |

[a] "WSJ", "H", and "L" refer to chapters in Willmer, Stone & Johnston; Heinrich; and Lambers et al., respectively.

[b] May be supplemented with readings from the primary literature, as announced in class.

| Week | Laboratory Activities |
|---|---|
| 1 April | Hypothesis generation exercises (verbal presentation at end of lab; write-up due in lab next week). |
| 6-7 Apr | Field trip to Second College Grant. Forest and stream ecology; winter ecology; development of research questions (exercise due in 1st lab after trip) |
| 8 April | Research Problem #1: Insect growth and metabolism (write-up due in lab week of 22 Apr). |
| 15 April | Literature critique #1 (written critique due in lab). RP #1, cont.: Practicum in data analysis and presentation. |
| 22 April | Research Problem #2: Plant physiological ecology (write-up due in lab week on 6 May). |
| 29 April | Week 5: RP #2, cont. Modeling exercise (due in lab next week). |
| 6 May | **Verbal proposal presentation for Student Initiated Research Projects** (public poster presentation at end of term). |
| 13 May | Literature critique #2 (written critique due in lab).<br>SIRP, cont. **Refined written proposal due in lab**. |
| 20 May | Literature critique #3 (written critique due in lab).<br>SIRP, cont. **Data presentation to peers** |
| 3 June | **Public poster presentations** of Student Initiated Research Projects. |