Experimental Field Plant Biology
Summer Field Course
Hort. Crop Sci. or Plant Cell & Molec. Biol. 693

Target Students: Students interested in plant stress and experimental field biology.
Subject Matter: Survey of plant responses to the environment along an altitudinal (temperature, light intensity and water availability) gradient from the peaks of the White Mountains (14,000') to depths of Death Valley (-150'), California. Recommended pre-requisite: PCMB 436, HCS 621 or permission of instructor. The lecture/lab course will focus on the following techniques:

- Data logging of temperature and light regimes in the field
- Analysis of CO_2 and water exchange in plants using field-portable infra-red gas analyzers.
- Analysis of chlorophyll fluorescence kinetics (*in vivo* and *in vitro*) to assess photosynthetic adaptation to stress.
- Measurement and interpretation of water potential and water stress status using pressure bombs and dew point psychrometers.
- Measurement of photosynthetic oxygen evolution *(in vitro*).
- Extraction and characterization of plant photo-protective pigments.
- Analysis of plant stress gene expression

When: 2nd summer session, 2005; July 26, 2005 - August 27, 2005.
Where: First two weeks will be lecture and lab in Columbus. Second two weeks will be field measurements at **White Mountain Research Center (WMRC), Bishop, California**. The final week will be back in Columbus to do pigment (HPLC), and RT-PCR analyses of stress-induced genes using samples collected from the field. The WMRC is operated by the University of California at San Diego. See website at: **http://www.wmrs.edu/**
What is needed to participate: A sense of adventure. An interest in experimental plant biology in a real world setting. Outdoor camping equipment (cold weather and hot weather outdoor clothing, sleeping bag, etc.). In addition to tuition costs, you will need ~ $1,200-1,500 to cover expenses for room and board, round trip airfare to Las Vegas, and 4WD travel. Interested in learning more? See PCMB Course website; http://www.biosci.ohio-state.edu/~plantbio/osu_pcmb/courses/courses.htm.
Instructors: Contact Dr. Richard Sayre or Dr. Jim Metzger for more information. Dr Sayre can be reached at sayre.2@osu.edu, Phone: 292-9030; Office, 520 Aronoff Labs, 318 W. 12th Avenue. Dr. Metzger can be reached at, email, metzger.30@osu.edu; phone, 292-3854; Office, 348 Howlett, 2001 Fyffe Ct. **To hold the course a minimum of 10 students will be needed. Please contact Dr. Sayre or Dr. Metzger by December 31, 2004, to let us know if you are interested**.

Estimated Student Expenses (car travel costs will vary depending on number of students enrolled):

Airfare (round trip) to Las Vegas	$300
Room and Board at WMRC (two weeks)	$700
Car travel (4WD)	$200
Incidentals	$100
Total	$1,300

Course structure:

Lecture: MWF; 2 hrs each

Lab: TR; 2 hrs each

Required text; "Plant Physiological Ecology" by H. Lambers;

LECTURE/LAB NUMBER	WEEK, LOCATION	TOPIC
Lecture 1	1, Columbus	Introduction to physiological ecology of plants, history and future directions
Lab 1		Greenhouse monitoring of light flux, temperature, water vapor
Lecture 2		Theory of gas exchange measurements of photosynthesis and water vapor exchange
Lab 2		Analysis of leaf photosynthetic CO_2 and water exchange
Lecture 3		In vitro measurements of photosynthetic electron transport
Lecture 4	2, Columbus	Theory of chlorophyll fluorescence kinetics and their interpretation
Lab 3		In vitro measurements of oxygen evolution and chlorophyll fluorescence decay kinetics
Lecture 5		Theory of water potential measurements
Lab 4		Measurement of water potentials in plants and vapor pressure deficit. Planning for trip to the WMRC.

Lecture 6		Stress protection and avoidance strategies in plants; the role of pigments, redox control, gene expression responses
Field experiments at the WMRC and Death Valley, Calif.	3 and 4 WMRC, Calif.	In field measurements of photosynthetic performance and water and gas exchange rates as a function of changes in water potential, temperature and edaphic conditions across various environmental gradients. Extraction of pigments and mRNA from plants.
Lecture 7	5, Columbus	Data interpretation from field experiments (in class exercise)
Lab 5		HPLC analysis of pigment extracts
Lecture 8		Molecular responses to stress, revisted
Lab 6		RT-PCR analyses of stress and control gene expression levels from material collected at WMRC.
Lecture 9		Student presentations of results