

Plant Physiology – Fall 2017
Professor: Dr. Sasha Wright

Lectures: Tues/Thurs 8am-8:50am in **BIOS 245 (WILL BE IN ASCL 231 after first week)**

Labs: Tues/Thurs 9am-11:30am in **ASCL 231**

Contact information: awrigh20@calstatela.edu

Office Hours: LKH 315, TUES 1-2pm, drop meetings are okay when my door is open, and you can email me ANY TIME to schedule a meeting outside of office hours.

Course Description: In this class we will explore physiological, developmental, morphological, and anatomical adaptations of flowering plants (and a few gymnosperms) to diverse environments. We will utilize readings from textbooks and the primary literature to explore concepts such as: drought adaptation, flood adaptation, seed dormancy, plant hormone signaling, and phytoremediation. Students will be expected to lead critical discussions of special topics in the primary literature. Labs will be an opportunity to design experiments to address some of these concepts in more detail.

We will use some of the descriptive and experimental methods that scientists employ to investigate plant physiology and responses to environmental factors. These methods will sharpen your observational skills, your ability to obtain and analyze data, and your integration and synthesis of information about the world around you. You will be asked to communicate your understanding of plant physiology both orally and in writing.

We will explore a series of questions as we investigate advanced concepts in plant physiology:

- What controls photosynthesis and respiration?
- What controls water loss and how does a plant balance inevitable water loss with the need for energy gain?
- What are the consequences of too little water? Too much water?
- How does plant size (seeds, seedlings, grown plants) affect function?
- What is plant behavior and how does this mediate the way that plants interact with the environment and with other plants?

Books and Resources:

Books required for the course:

- (1) Capon, B. 2010. Botany for Gardeners: third edition. Timber Press, Portland, OR.
- (2) Bound field notebook (recommend: Rite in the Rain #374-M Mini Field Flex Bound Book, 112 pages)
- (3) READINGS ON MOODLE

On Reserve in the library:

Lambers, H., Chapin, F.S. III, Pons, T.L. 2014. Plant Physiological Ecology 2nd ed. Springer-Verlag. New York, NY.

Recommend: iNaturalist app and OpenTreeMap app

Evaluation Schedule and Scheme

<u>Evaluation</u>	<u>Contribution</u>	<u>Due Date</u>
Quizzes & in-class assignments	20%	Throughout term
Lab Notebook	15%	Throughout term
First experiment: proposal & poster	20%	Oct. 12
Second experiment: proposal & poster	20%	Nov. 28
Group primary lit presentation	5%	Throughout term
Final exam	20%	Dec. 5

Other important dates:

Thanksgiving break, no class	Nov. 23
Last day of class	Dec. 17

Laptops & cell phone in class: For lectures and many laboratory activities, this is a **no technology classroom**. This means you will need to bring pen/paper to class and take handwritten notes. You can print out lectures slides from Moodle AFTER lectures, but this should be used to supplement your in-class notes.

Grading: Grading will be based on exams, quizzes, labs, in-class discussions, and writing assignments. Because much of the class is based on in-class assignments, attendance will be very important. It is essential that you organize transportation to the two fieldtrips in advance, and that you double check all important dates and ensure you will be able to attend class. Because the class schedule is set in advance, conflicts with outside employment will not be accepted as a valid excuse for absence at fieldtrips or other class sessions. **If you have a medical emergency or you notify me at least two weeks ahead of time regarding a scheduling conflict, I will work with you to figure out how to make up the work. I will periodically take attendance, but the real damage to your grade will come from missing in-class work.**

Fieldtrips: There are two fieldtrips throughout the semester. You need to organize your own transportation to these sites and be sure you do not have a scheduling conflict beforehand.

Academic Misconduct: Cheating, plagiarism, or other acts of misconduct will not be tolerated (more on this below). Students who violate the University's Academic Honesty Policy (<http://www.calstatela.edu/academicssenat/handbook/ch5a>) will be subject to disciplinary action and may receive a failing grade in the course (even for a single violation). Students are expected to do independent work on all exams, homework, field notebooks, and any written assignments.

Assignments: Unless otherwise discussed, assignments will be automatically marked down by 50% if turned in late, and will not be accepted if turned in over a week late.

Services for students with disabilities:

Reasonable accommodation will be provided to students with documented disabilities on a case-by-case basis. Students must register with the Office for Students with Disabilities (<http://web.calstatela.edu/univ/osd/>; Administration Building, Room 127; 323-343-3140) and provide appropriate documentation to the university before any academic adjustment will be provided. It is the responsibility of the student to initiate any request for accommodation in the course; the Office for Students with Disabilities does NOT notify faculty unless the student requests it for that course. I am happy to make accommodations, but I cannot make them without prior notice.

Primary Literature Readings:

- Ainsworth, E.A. et al. 2003. Is stimulation of leaf photosynthesis by elevated carbon dioxide concentration maintained in the long term? A test with *Lolium perenne* grown for 10 years at two nitrogen fertilization levels under Free Air CO₂ Enrichment (FACE). *Plant, Cell and Environment* 26: 705-714.
- Aranda, I., Pardos, M., Puértolas, J., Jiménez, M. D., & Pardos, J. A. 2007. Water-use efficiency in cork oak (*Quercus suber*) is modified by the interaction of water and light availabilities. *Tree Physiology*, 27(5), 671–677.
- Ashton, P.M.S & Berlyn, G.P. 1992. Leaf adaptations of some *Shorea* species to sun and shade. *New Phytologist* 121: 587-596.
- Bailey-Serres, J. & Voesenek, L.A.C.J. 2008. Flooding Stress: Acclimations and Genetic Diversity. *Annual Review of Plant Biology* 59: 313–339.
- Bazzaz, F.A., Chiariello, N.R., Coley, P.D. & Pitelka, L.F. 1987. Allocating resources to reproduction and defense. *BioScience*: 58–67.
- Boege & Marquis 2005. Facing herbivory as you grow up: the ontogeny of resistance in plants. *Trends in Ecology & Evolution* 20(8): 441-448.
- Colmer, T.D. & Voesenek, L.A.C.J. 2009. Flooding tolerance: suites of plant traits in variable environments. *Functional Plant Biology* 36: 665.
- Cook, B. I., Ault, T. R., & Smerdon, J. E. 2015. Unprecedented 21st century drought risk in the American Southwest and Central Plains. *Science Advances*, 1(1), e1400082–e1400082. <http://doi.org/10.1126/sciadv.1400082>
- Fotelli, M., Radoglou, K. & Constantinidou, H. 2000. Water stress responses of seedlings of four Mediterranean oak species. *Tree Physiology* 20: 1065.
- Mangan, S.A., Schnitzer, S.A., Herre, E.A., Mack, K.M.L., Valencia, M.C., Sanchez, E.I. & Bever, J.D. 2010. Negative plant-soil feedback predicts tree-species relative abundance in a tropical forest. *Nature*: 1–5.
- Mommer, L., Lenssen, J.P.M., Huber, H., Visser, E.J.W. & De Kroon, H. 2006. Ecophysiological determinants of plant performance under flooding: a comparative study of seven plant families. *Journal of Ecology* 94: 1117–1129.
- Volkov, A.G., Adesina, T., & Jovanov, E. 2007. Closing of a venus flytrap by electrical stimulation of motor cells. *Plant signaling and behavior* 2(3): 139-145.
- Walck, J.L., Hidayati, S.N., Dixon, K.W., Thompson, K. & Poschlod, P. 2011. Climate change and plant regeneration from seed. *Global Change Biology*.
- Wright, A., Schnitzer, S.A. & Reich, P.B. 2014. Living close to your neighbors-the importance of both competition and facilitation in plant communities. *Ecology*.
- Wright, A. J., de Kroon, H., Visser, E. J. W., Buchmann, T., Ebeling, A., Eisenhauer, N., et al. 2017. Plants are less negatively affected by flooding when growing in species-rich plant communities. *New Phytologist*, 1–12. <http://doi.org/10.1111/nph.14185>

Tentative Schedule: Note that dates, topics, and activities may change. Any changes to the schedule will be announced in class or in labs and posted online on the class Moodle site or via email. It is essential that students stay informed of any schedule changes.

Week	Date	Lecture Topic	Lab	Reading	Due (at beginning of class)
1	8/22/17	Welcome & Plant Morphology & Plant ID	Campus Walk – field trip		
	8/24/17	Flowering & Fruiting	Super Market Botany	Capon Ch. 2 & 9	Letter to Dr. Wright
2	8/29/17	Cell Structure & Function	Intro to cells & microscopes	Capon pgs. 18-23 & pgs. 80-89	
	8/31/17	Meristems, herbaceous vs. woody sp.	Intro to primary literature + Forming scientific questions (campus solo observations, 10 questions & group discussion)	Capon pgs. 23-26 & Capon Ch. 3	Lab notebooks due (checked during lab)
3	9/5/17	Photosynthesis & DTE	Small group figure exercise (need to schedule office hours with me)	Capon pgs. 181-189 & Ainsworth et al. 2003 (on moodle) & 7 keys to understanding an introduction	Summary of Ainsworth et al. 2003 introduction (10-15 bullet points)
	9/7/17	Photosynthesis	Small groups present on figure and methods from Ainsworth et al. 2003	Re-read Ainsworth et al. 2003	Small group presentations (ppt)
4	9/12/17	Sun & Shade leaves	Design a light experiment	Lambers et al. pgs. 27-36 (on moodle) & Ashton & Berlyn 1992 (on moodle)	Hypothesis + drawing of methods from Ashton & Berlyn (1992)
	9/14/17	Plant water relations	Library research session (B105) & discuss proposals & Read/review NSF proposal	Capon pgs. 167-181	

5	9/19/17	Descriptive Statistics	Collect and analyze light experiment data	Barry-Jester 2016 (on moodle)	
	9/21/17	Plant water relations	Campus fieldtrip (solo, 10 questions, small group brainstorming)	Lambers et al. pgs 163-170 (on moodle)	Lab notebooks (checked during lab)
6	9/26/17	Ontogenetic changes – Dr. Wright will do example presentation	Pitch ideas & Peer review	Wright et al. 2014 (on moodle)	Project proposals DUE!!!
	9/28/17	Adaptations to plant water stress	Start plant water relations lab	Fotelli et al. 2000 PRESENTERS:	Three questions about Fotelli et al. 2011
7	10/3/17	Plant water stress	Continue plant water relations lab	Aranda et al. 2007 PRESENTERS:	Introduction that describes context for our study (10-15 sentences)
	10/5/17	Drought & Climate Change	Analyze plant water relations data	Cook et al. 2015 PRESENTERS:	Methods for our study (10-20 bullets + drawing)
8	10/10/17	Plant-soil interactions	Work on posters (peer review of Wright et al. 2014 posters)	Mangan et al. 2010 PRESENTERS:	Poster for Wright et al. 2014 (using template)
	10/12/17	POSTER SESSION (Lecture & Lab)			
9	10/17/17	Movie Day (start at 10:30am)	Group Discussion		
	10/19/17	Respiration	Seed Respiration Lab	Capon pgs. 77-80 & Lambers pgs. 119-122	
10	10/24/17	Flood tolerance & anoxia	Seed Respiration Lab	Colmer & Voesenek 2009 PRESENTERS:	Three questions about Colmer & Voesenek 2009

	10/26/17	FIELD TRIP TO BALLONA WETLANDS: meet there at 8:30am			
11	10/31/17	Flood tolerance & anoxia	Pitch ideas & Peer review	Mommer et al. 2006 PRESENTERS:	Project proposals DUE!
	11/2/17	Ecological context & Flooding	Start flooding lab	Wright et al. 2017 PRESENTERS:	Three questions about Wright et al. 2017
12	11/7/17	Energy budgets & allocation	Continue flooding lab	Bazzaz et al. 1987 PRESENTERS:	Three questions about Bazzaz et al. 1987
	11/9/17	Energy budgets & allocation	Continue flooding lab	Boege & Marquis 2005 PRESENTERS:	Three questions about Kozłowski 1992
13	11/14/17	Seed Dormancy	Analyze flooding lab results	Walck et al. 2011 PRESENTERS:	Three questions about Walck et al. 2011
	11/16/17	Plant Behavior	Work on posters	Runyon et al. 2006 (optional: Heil & Bueno 2007)	
14	11/21/17	FIELD TRIP TO EATON CANYON: meet there at 8:30am			
	11/23/17	NO CLASS (Thanksgiving)			
15	11/28/17	FINAL POSTER SESSION (Lecture & Lab)			
	11/30/17	Study Session (Lecture & Lab)			
16	12/5/17	FINAL EXAM			

Academic Integrity and misconduct

Academic misconduct is an act in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts.

What is plagiarism? Directly quoting the words of others without using quotation marks or indented format to identify them; or, using sources of information (published or unpublished) without identifying them; or, paraphrasing materials or ideas of others without identifying the sources. Go to: <http://www.plagiarism.org> for more examples.

What are the consequences? The consequences of plagiarism are severe and cannot be overstated. Punishment can range from an “F” on an assignment to expulsion from the college and a permanent note in your academic record. Please weigh the consequences of cheating on your assignments. Nothing you will be assigned in any course will ever outweigh your academic future or your long-term goals. Nearly every problem that might come up can be worked around except for cheating. Everything you turn in is understood to be your work unless you have noted otherwise.

A word on Google: Google, the internet, and a range of other software tools have made it incredibly easy to detect plagiarism (from other sources and among students). If you plagiarize something, I will know.

Giving credit where credit is due:

So you need the facts and information found on a web site, textbook, or journal article – how can you transfer them to your own work without being accused of plagiarism? You should take that information and put it into your own words. This is called paraphrasing. This can often frustrate students because they do not know how much the original phrase needs to be changed in order for their own work not to be considered plagiarized. An ideal way to prevent this is to read the original material carefully and thoroughly, then step away from the source or computer for 5 to 10 minutes. Return to your work after that time and write down what you remember – it will be in your own words. You can check the source for accurate reporting of statistics or other specific data after you have written the narrative.

Remember, even when you paraphrase, **YOU MUST CITE** all the information that you have included in your work that is not common knowledge. When in doubt, go ahead and cite it. It **NEVER** hurts to write down the web page from which you drew material.

If you need a direct quote, you should place quotation marks around the statement that has been quoted directly. However, in formal scientific writing, in general, we do use direct quotations. There are generally **ONLY THREE REASONS** you should use directly quoted material: art, history, and news. Is the phrase artistic in and of itself and as such will the quality and meaning of the phrase be lost due to paraphrasing? “To be or not to be?” “Frankly my dear, I don’t give a damn.” “Red fish, blue fish, one fish, two fish.” These statements are particularly artistic and have some historical component and the directly reported phrases bring up specific contexts and knowledge for the reader.

Adapted from:

Grossman, Y. 2000. Giving credit where credit is due. Beloit College Biometrics handout. Plagiarism.org