

Plant Science 9415: Physiology of Plant Responses to the Environment
Winter Semester, Even-Numbered Years
8.30 –9.45 a.m., Tuesday and Thursday

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Lecture Topic

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| 1 | Introduction |
| 2 | Water relations review; principles of expansive growth |
| 3 | Growth models - theory |
| 4 | Growth models - experiments |
| 5 | Cell wall adjustments |
| 6 | Spatial growth patterns; kinematics; tissue specificity |
| 7 | Acid growth, cell wall proteins |
| 8 | Growth-induced water potentials - are they real/important? |
| 9 | Osmotic adjustment |
| 10 | |
| 11 | Discussion Topic 1: Cell wall responses to water stress/salinity (roots and leaves) |
| 12 | Discussion Topic 2: Does osmotic adjustment/solute engineering improve drought and/or salinity tolerance? |
| 13 | ABA |
| 14 | ABA and reactive oxygen species (ROS) in water-stressed roots |
| 15 | Discussion Topic 3: Is ABA an inhibitor or promoter of growth? |
| 16 | Discussion Topic 4: Does engineering increased ABA improve drought and/or salinity tolerance? |
| 17 | Discussion Topic 5: ABA/ethylene interactions |
| 18 | Discussion Topic 6: ABA/ROS/NO interactions |
| | SPRING BREAK |
| 19 | Root-shoot communication |
| 20 | Root shoot communication |
| 21 | Discussion Topic 7: Aquaporins: effects on plant water transport and growth |
| 22 | Discussion Topic 8: Role of ABA as a root signal of soil drying – stomatal closure |

23	Discussion Topic 9: Root signals and soil drying – leaf growth
24	Discussion Topic 10: Root signals and shoot responses to mechanical impedance
25	Discussion Topic 11: Shoot growth responses to flooding
26	Proposal presentations (2)
27	Proposal presentations (3)
28	Proposal presentations (3)
29	Proposal presentations (3)

This course focuses on the physiological processes and controls regulating plant responses to environmental variation, with emphasis on growth and development.

Classes consist of either background lectures or student presentations (around 40 minutes) of a topic followed by group discussion. I select 3 to 5 important papers on each topic (classic papers, recent advances and/or controversies) to provide a foundation for the presentations. Each student will present one topic. All students are expected to read the selected papers and to participate in the discussions. Each student (except the presenter) should bring to the presentation class a 1-page overview of their perception of the key objectives, results and conclusions of, and the interrelationship between, the selected papers. The presenting student will prepare a report (2 to 3 single-spaced pages) providing a summary of the presentation and discussion for distribution at the following class.

The primary functions of the presentation/discussion format are to gain experience in critically assessing journal articles and in organizing material and conveying it effectively to an audience, in addition to learning about the topics. In your presentations, you should focus on key issues that you consider are of most importance. Sometimes a complete paper may warrant in-depth analysis, but in other cases you might wish to discuss only one particular experiment. Presenters are encouraged to look up additional papers.

The ability to assess the key information from a body of literature is also vital for writing manuscripts and research proposals. Therefore, preparation of a research proposal will be required to complete the requirements of this class. The proposal can be on any topic of relevance to the course, and can be related to but not specifically on the presentation topics. The proposal should illustrate your understanding of the concepts, approaches and methods that are covered in the course. Proposals should be prepared according to the USDA/National Research Initiative Competitive Research Grants guidelines and should be handed in by Monday, May 10th at the latest (I have to grade by Friday, May 14th). In addition, you should prepare a 20-25 min presentation on the key background, objectives and experimental plan to be given during the final four meetings of the class (three proposal presentations per class).

The course will be graded on the strengths of the oral (25%) and written (15%) topic presentations, the 1-page topic paper overviews (collectively 10%), and the proposal (50%, including 10% for the oral presentation). General discussion participation will also be considered.

The selected papers and other recommended reading material will be available for short-term loan (for copying) from my lab (3-11 Agriculture Building).