INSTRUCTOR: Robert D. Slocum

SEMINAR: TH 9:00 – 11:30 AM, HS G39

OFFICE HOURS: By appointment, HS G46

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COURSE OVERVIEW:

Each student in the class will research various topics in plant molecular biology and plant biotechnology (see below), reading original literature (peer-reviewed and "lay" publications). Students are also encouraged to make use of considerable web-based resources devoted to cutting-edge plant research and plant biotechnology. The instructor will provide some assistance in identifying relevant readings and review articles and, occasionally, will give background lectures on general topics, such as plant transformation.

We will alternate between discussing assigned papers, as a class, and individual student presentations, every other week. During presentation weeks, two students will give 45 – 60 minute oral presentations providing an overview of their topic, including human relevance. It is expected that at least one original research paper will be critically evaluated and discussed during the course of the talk.

Students are encouraged to use computer-based presentations (Power Point, web pages, graphics, etc.) whenever possible, but handouts and the chalk board can be effectively used, as well. A networked computer and projection system will always be available in the seminar room.

No later than Tuesday by 12:00 PM preceding each set of talks, the student presenters must make any handouts available to the instructor. Materials will be duplicated and left outside of HS G46 for students to pick up and read before class. When appropriate, materials will be posted to the "Course Documents" folder on the BlackBoard (www.blackboard.goucher.edu) site for Bio 387. Power Point presentations can be downloaded to the classroom computer from campus servers but backup files should also be "burned" onto a CD-ROM disk or stored on a USB flash drive in case network-related problems make downloading impossible.

COURSE GRADING:

Oral presentations during the semester will comprise 60% of the course grade. Talk organization and clarity, preparation, and responses to questions from students and the instructor will be used to evaluate the student. Grading will not be based upon the use of computers, aesthetic quality of visual aids, etc. in the presentation. However, presentation materials should be of adequate quality so that they can be easily read. Occasionally, non-presenting students in the class will provide a brief evaluation in the form of anonymous peer-reviews, which will be provided to the presenting student the following week. Students often benefit from such feedback, which is often perceived as being less intimidating and helpful in facilitating better communication with one's peers.

An additional 20% of the course grade will be determined by class participation. It is expected that non-presenting students will have read handouts *before class*, identifying possible questions or issues for the presenting students to address in class. An active dialog between presenting and non-presenting students is a major goal for any seminar class at Goucher.

To ensure that readings are done before class, the final 20% of the course grade will be based upon type-written summaries of handouts or instructor-assigned readings. The summaries are to be handed in at the beginning of each class (except for the presenters). The summaries should be concise (no longer than a single, double-spaced page) and well-organized, accurately portraying the main ideas in the readings.

GRADING SUMMARY:	Oral presentations	60%
	Class participation	20%
	Summaries	20%

<u>Cell Phone Policy</u>

As a courtesy to other students, please turn off your phone before coming to class. The first time it rings in class, you will receive a warning. The second time, you will be asked to leave.

TOPICS:

The instructor will provide the class with a list of topics that students may wish to investigate, although any area of plant molecular biology or biotechnology may be researched.

Course Schedule

Date	Topic	Speaker(s)
Sept. 3	Course introduction Discussion of possible topics Plant transformation technology	Slocum
Sept. 10	The Plant Genome Initiative Plant gene expression analyses Single gene studies (RT-PCR; “reporter constructs”) Transcriptome analyses (microarrays) "Reverse genetics" approaches to gene identification and functional characterization T-DNA “knockout” mutants RNAi gene silencing technology	Slocum
Sept. 17	Student talks	
Sept. 24	**No class; instructor at meeting in Arizona**	
Oct. 1	Assigned readings	
Oct. 8	Student talks	
Oct. 15	Assigned readings	

Date	Topic	Speaker(s)
Oct. 22	Student talks	
Oct. 29	Assigned readings	
Nov. 5	Student talks	
Nov. 12	Assigned readings	
Nov. 19	Student talks	
Nov. 26	**No class scheduled. THANKSGIVING RECESS**	
Dec. 3	*The Future of Food* (movie)	
Dec. 10	COURSE EVALUATIONS	

Plant Biotechnology Topics

Metabolic engineering - plants as “bioreactors”
- Biopolymer engineering (e.g., biodegradable plastics)
- Pharmaceuticals
  - anti-cancer compounds
  - peptide hormones
  - alkaloid drugs
  - “plantibodies”
  - vaccines (injectable and oral)
- Production of “biofuels”
- Altered pigment biosynthesis (floral coloration, etc.)

Engineering of food qualities
- Modification of fruit ripening
- Altered composition of lipids (oils, fats, waxes; fat-soluble vitamins; “golden rice”)
- Alteration of seed storage protein composition or content
- Related issues:
  - “Food security” issues (agribusinesses vs. small farms and developing world agriculture)
  - Production and labeling of bioengineered foods

Enhanced mineral nutrient or heavy metal uptake, storage, and availability
- Phosphate, iron uptake

Phytoremediation
- Heavy metals, radionuclides
- Organic pollutants

Increased photosynthetic efficiency and crop yield

Herbicide resistance and related issues

Insect, nematode and pathogen (fungi, bacteria, viruses) resistance
- Bt toxin resistance – implications for insect control

Stress tolerance
- Freezing / cold tolerance (“antifreeze" proteins, etc.)
- Drought resistance
- Salt tolerance

Plant Biotechnology Topics (cont)

Bioethics and miscellaneous topics
- Use of Terminator ("suicide" seed technology) and other methods for controlling distribution of bioengineered crops
- Bt toxin containing crop plants – safety, unintended consequences
- Antibiotic-resistance genes as "marker" genes in plant transformation
- "Intellectual property" rights vs. the "common good"
- Biological warfare against crops

Plant Molecular Biology Topics

Light and hormone-signaling transduction pathways
- Molecular characterization of hormone receptors and signaling pathways
- Light regulation of flowering
  - Circadian and photoperiodic inputs (and comparison with animal model)