Bio 387 – Seminar: Plant Molecular Biology and Biotechnology Fall 2005

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.

Weekly, we will alternate between discussing assigned papers, as a class, and individual student presentations. During presentation weeks, two students will give 45 – 60 minute oral presentations providing an overview of their topic, identifying the major researchers in the particular field of study and the main issues, 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 overhead transparencies, 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 BlackBoard (www.blackboard.goucher.edu). 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 dowloading 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, but presentation materials should be of high-quality.

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 the readings, 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%

Cell Phone Policy

As a courtesy to other students, please turn off your phone before coming to class. The first time it rings in class, you get a warning. The second time, you get it back at the end of the semester.

TOPICS:

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

Course Schedule

Date	Topic	Speaker(s)
Sept. 1	Course introduction Discussion of possible topics Plant transformation technology	Slocum
Sept. 8	The Plant Genome Initiative Plant functional genomics topics ESTs and UniGene database DNA arrays and gene expression profiling T-DNA insertional mutants	Slocum

Course Schedule **(cont.)**

Date	Topic	Speakers
Sept. 15	Student talks	
Sept. 22	Assigned readings	
Sept. 29	Student talks	
Oct. 6	Assigned readings	
Oct. 13	Student talks	
Oct. 20	Assigned readings	
Oct. 27	Student talks	

Date	Topic	Speaker(s)
Nov. 3	Assigned readings	
Nov. 10	Student talks	
Nov. 17	Student talks	
Nov. 24	**No class scheduled. THANKSGIVING RECESS**	
Dec. 1	COURSE EVALUATIONS	

Plant Biotechnology Topics

Engineering of plant enzymes / metabolism (various topics)
Altered pigment biosynthesis (floral coloration, etc.)
Engineering of food qualities
- Modification of fruit ripening
- Altered composition of lipids (oils, fats, waxes; fat-soluble vitamins
- Alteration of seed storage protein composition or content

Enhanced mineral nutrient or heavy metal uptake, storage, and availability
- Phosphate, iron uptake
- Heavy metal uptake (phytoremediation applications)

Phytoremediation – non-heavy metal topics
Increased photosynthetic efficiency and crop yield
Herbicide resistance
Plants as "bioreactors"
- Biopolymer engineering (e.g., biodegradable plastics)
- Pharmaceuticals (anti-cancer compounds, peptide hormones, alkaloid drugs, "plantibodies", vaccines (injectable and oral))

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

Improved stress tolerance
- Freezing / cold tolerance ("antifreeze" proteins, etc.)
- Drought resistance (modification of osmolite-producing pathways; altered development of stomata to reduce transpiration water loss, etc.)
- Salt tolerance

Bioethics
- Use of Terminator ("suicide" seed technology) and other methods for controlling distribution of bioengineered crops
- Production and labeling of bioengineered foods
- Bt toxin containing crop plants – safety, unintended consequences
- "Food security" issues (agribusinesses vs. small farms and developing world agriculture)
- Antibiotic-resistance genes as "marker" genes in plant transformation
- Biological warfare against crops
- "Intellectual property" rights vs. the "common good"

Plant Molecular Biology Topics

Light and hormone-signalling transduction pathways
Concept of translocated mRNAs as regulators of plant growth and development
RNAi gene silencing technology and its applications
"Reverse genetics" approaches to gene identification and functional characterization
Molecular characterization of hormone receptors and signaling pathways