

# ***Plant Physiology – Biology (or ES) 210***



*Professor Barry Logan*  
*Laboratory Instructor: Jaret Reblin*

Lecture: MWF: 8:30 – 9:25  
Druckenmiller 4

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Laboratory: W or Th: 1:00 - 3:55; Fri: 1:30 - 4:25  
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**Prerequisites:** Biology 102, 104 or 109

**Text:** *Plant Physiology 4<sup>th</sup> ed.* (Taiz and Zeiger)

**Grading:** Grades will be determined based upon a 1000 pt. system, composed of the following components (described on the following page):

	<u>Points</u>
Mid-term #1	125
Mid-term #2	175
Final exam	250
Summary/analysis of primary literature	100
Friday Forum	50
Photosynthesis/photoprotection paper	150
Final project poster	100
Other laboratory assignments	50
<b>Total</b>	<b>1000</b>
Participation & Involvement	The "X" Factor

Spring, 2008

Exams Exams will encompass material presented in lecture and lab (although the emphasis will be upon lecture material). The final will be cumulative, but weighted more heavily on the material presented since the second mid-term exam. My exams often include questions that require you to 'go beyond' the material presented in class or to synthesize material from more than one lecture. On all questions I am searching for *correct, complete, clear* and *concise* answers.

Summary/analysis of primary literature On one occasion during the semester I will ask you to read a paper from the primary literature and write a summary/analysis. This need only be 2 pages in length (double-spaced). In it you should summarize the experiments and findings, discuss whether the experimental results completely support the findings, and offer your overall impressions.

Photosynthesis/photoprotection lab write-up This report is to be written in the form of a scientific manuscript (refer to the handout Writing a Scientific Paper) that describes all aspects of your self-designed experiment examining the responses of photosynthesis and photoprotection to the environment.

Final project poster In small groups, you will be asked to perform an independent research project on a subject of your choosing and present your results as a poster. You will be responsible for all facets of the project: conception, experimentation, interpretation and presentation. You will have the opportunity to anonymously evaluate the effort put forth by the other members of your group and you will also play a part in evaluating the work of other groups.

Other lab assignments These may include a quiz on native plant identification, pre-lab quizzes, a review of lab notes from your independent research projects, and/or written summaries of lab research projects.

Friday Forum Each week at precisely 8:31AM on Friday we will break from lecture to complete an exercise or enter into a discussion concerning the lecture material of that week. The format of Friday Forum will vary according to the needs of the material at hand. You may be asked to answer a question, interpret an experiment, design an experiment, etc. Successful completion of these assignments will indicate to be that you are staying up with the material and that you are present and on-time for Friday lecture.

Participation & involvement The success of this course, both collectively and for you as individuals, hinges on your active participation. The design of many labs is somewhat loose and open-ended, giving you the opportunity to explore the material in a manner that best suits you. Many lectures require your preparation and discussion. If you show up for lectures and labs mentally keen and full of zeal and curiosity, then we'll all enjoy the course fully and come away with a meaningful appreciation for plants. When assigning grades to those students who find themselves "on the borderline", I will give serious consideration to their level of participation and involvement.

We will not set numerical standards for grades until the end of the course; however, please feel free to make an appointment to discuss how you're doing, if you like.

A passing grade in *Plant Physiology* requires a passing knowledge of the subject matter, as reflected by exam scores. An average exam score of 60% or above is required for passing this course.

**Plant Physiology – Biology (or ES) 210****Lecture syllabus**

<b>Date</b>	<b>Lecture topic</b>	<b>Reading</b>
	<b>Photosynthesis &amp; Respiration</b>	
Jan. 21	Overview	Ch. 1
23	Light gathering and electron transport	Ch. 7
25	Light gathering and electron transport	Ch. 7
28	Light gathering and electron transport	Ch. 7
30	The Calvin cycle	Ch. 8
Feb. 1	Photoprotection	Reading #1
4	Photoprotection (cont.)	
6	Photorespiration	Ch. 8
8	CAM photosynthesis	Ch. 8
11	C4 photosynthesis	Ch. 8
13	Translocation	Ch. 10
15	Photosynthesis in winter	Reading #2
18	Photosynthesis in winter (cont.)	
<b>20</b>	<b>Exam #1</b>	
22	Alternative oxidase / Thermogenesis	
	<b>Water &amp; Nutrients</b>	
25	Introduction / The properties of water	Ch. 3
27	Water potential and its assessment	Ch. 3
29	The soil-plant-atmosphere continuum	Ch. 4
Mar. 3	S.P.A.C. & Fick's Law	Ch. 4
5	Xylem cavitation	Reading #3
7	Xylem cavitation (cont.)	
	<i>Spring break</i>	
24	The soil microenvironment	Ch. 5
26	Mineral uptake/Mycorrhizae	Ch. 5
28	Alternative modes of gathering nutrients	
31	Alternative modes of gathering nutrients (cont.)	
	<b>Growth &amp; Development</b>	
April 2	Plant growth at the cellular level	Ch. 15
4	A few examples of plant hormones	t.b.a.
7	A few examples of plant hormones (cont.)	t.b.a.
9	Phytochromes	Ch. 17
11	Photoperiodism	p. 648-657
14	Vernalization	p. 657-667
<b>16</b>	<b>Exam #2</b>	
18	Plant movement	
	<b>Special Topics &amp; Ecophysiology</b>	
21	Genetically modified plants	Reading #4
23	Genetically modified plants (cont.)	
25	Genetically modified plants (cont.)	
28	Desert plants	
30	Parasitic plants	
May 2	Agroforestry	
5	Elevated CO <sub>2</sub>	Reading #5
7	Elevated CO <sub>2</sub>	

## Plant Physiology – Biology (or ES) 210

### Laboratory syllabus

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	<b>Week beginning</b>	<b>Laboratory</b>
<b>1</b>	<b>January 21</b>	Quantifying photosynthesis I- oxygen evolution
<b>2</b>	<b>January 28</b>	Quantifying photosynthesis II- chlorophyll fluorescence
<b>3</b>	<b>February 4</b>	Quantifying plant pigments – HPLC and TLC
<b>4</b>	<b>February 11</b>	CAM photosynthesis – class project Experimental design and hypothesis testing
<b>5</b>	<b>February 18</b>	Photosynthesis/photoprotection proposal review
<b>6</b>	<b>February 25</b>	Photosynthesis/photoprotection independent project
<b>7</b>	<b>March 3</b>	Photosynthesis/photoprotection independent project
<b>8</b>	<b>March 24</b>	Introduction to plant water relations
<b>9</b>	<b>March 31</b>	Plant water relations class project
<b>10</b>	<b>April 7</b>	Final research project
<b>11</b>	<b>April 14</b>	Final research project
<b>12</b>	<b>April 21</b>	Final research project Creating research posters
<b>13</b>	<b>April 28</b>	Nitrogen deficiency in plants – effects on leaf protein, photosynthetic capacities, and leaf carbohydrates
<b>14</b>	<b>May 6</b>	Research symposium - Tuesday May 6th at 6:00 pm

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#### Laboratory Policy

Laboratory attendance is mandatory. You may not hand in assignments from labs that you did not attend and you may not make-up missed quizzes. Missed labs could also be subject to a ten-point penalty. You must discuss any pending conflicts with the instructor *in advance*. Under some circumstances we may allow you to switch between sections on a given week, if that will eliminate a conflict, but this is not to be considered a generally accepted practice.

Read the laboratory in the manual before coming to lab. This will ease the flow of the lab session for you, the instructor and your lab-mates. We may be compelled to institute quizzes on the reading if it becomes clear that people are not doing it ahead of time.

Many of the lab exercises require that you work in groups. However, each individual is expected to keep track of his/her group's data and, when necessary, data generated by the entire class. You are expected to complete assignments individually (with the exception of the independent project). You will lose two points for each day that an assignment or lab report is late.

**Plant Physiology – Biology (or ES) 210**

<b>Assignment</b>	<b>Due date<sup>1</sup></b>
Oxygen evolution review question	In lab week of Jan. 28
Chlorophyll fluorescence review question	In lab week of Feb. 4
Plant pigments/HPLC review question	In lab week of Feb. 11
Research proposals for Photosynthesis/Photoprotection projects	Due by 5:00 PM on the day <b>before</b> your lab during the week of Feb. 18
Exam #1	Feb. 20
CAM project summary	In lab week of Feb. 25
Summary/analysis of primary literature	In class on March 9
Photosynthesis/Photoprotection paper submission	In lab week of March 31
Research proposal for final lab project	Due by 5:00 PM on the day <b>before</b> your lab during the week of April 7
Exam #2	April 16
Peer review of submitted manuscripts	April 18 (5:00 PM)
Paper revision	May 2 (5:00 PM)
Final project research symposium	May 6 – 6:00PM

<sup>1</sup> We reserve the right to adjust these due dates to suit the evolving needs of the course. If changes become necessary, you will be informed of them in lecture or lab.

*N.B.* – Please be aware that the final project research symposium takes place outside of regularly-scheduled class meetings. Plan accordingly.

### **The Academic Honor Code [excerpted from the Student Handbook]**

The success of the Academic Honor Code requires the active commitment of the College community. Bowdoin College expects its students to be responsible for their behavior on and off the campus and to assure the same behavior of their guests. Uncompromised intellectual inquiry lies at the heart of a liberal education. Integrity is essential in creating an academic environment dedicated to the development of independent modes of learning, analysis, judgment, and expression. Academic dishonesty, in or out of the classroom, is antithetical to the College's institutional values and constitutes a violation of the Honor Code. The Academic Honor Code plays a central role in the intellectual life at Bowdoin College. Students and faculty are obligated to ensure its success.

#### **III. Proscribed Conduct**

The following sections describe activities constituting breaches of the Academic Honor Code.

1. "Academic Dishonesty" includes but is not limited to (1) *the receiving, giving, or using of any assistance on quizzes, tests, written assignments, examinations or laboratory assignments; (2) references to sources beyond those authorized by the instructor in preparing papers, constructing reports, solving problems, or carrying out other academic assignments; (3) inadequate citation of sources; (4) acquisition, without permission, of tests, computer files or similar material which would give the student an unfair advantage on an assignment or examination; (5) submission of academic work not a student's own original effort; (6) use of the same work for multiple courses without prior knowledge of the receiving instructors; (7) depriving learners of access, including computer access, to library information through intentional monopolization, mutilation, defacing, unauthorized removal of books or other materials from College libraries, or purposeful failure to return library materials on a timely basis; (8) unauthorized altering of academic records (transcripts, grading sheets, Course Registration Cards, etc.).*

2. A number of Bowdoin College courses employ various kinds of collaborative assignments in several different situations, including homework, laboratory reports, and in-class assignments. When preparing such course work, students should follow the individual instructor's policy on collaboration. When the instructor permits collaboration among students, the use of another student's work or ideas should be credited properly.

3. It is the obligation of students to be thoroughly familiar with proper citation of sources and to consult and refer to authoritative style guides for research papers. New students will receive a copy of Sources during Orientation. Students should keep this booklet for reference throughout their years at Bowdoin. The Bowdoin College Library Web site provides links to style guides at <http://www.bowdoin.edu/dept/library/eref/write.html>. Students are particularly encouraged to consult the MLA Style Guides, Sources, and Bibliographic Formats for Citing Electronic Information. Plagiarism is possible with any work performed in any medium and any scholarly discipline. Plagiarism involves the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment in all such scholarly work as essays, examinations, quizzes, oral/written reports, homework assignments, laboratory reports, computer programs, music scores, choreography, graphic depictions, and visual representations. Plagiarism also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.