

BIOLOGY 4412

Dr. Gary Upchurch

Spring 2006

PLANT ANATOMY

Lecture: 10:00–10:50 MWF, 372 NSB

Lab: 2:00–5:00 T, 372 NSB

Tentative schedule of lectures, labs, and examinations

Date	Lecture topic	Readings	Laboratories
1/16	Martin Luther King Day, Classes do not meet		
1/18	Introduction to Course		None
1/20	Overview of Vascular Plants		
1/23	Overview of Tissues & Tissue Regions	1–6	
1/25	The Plant Cell	17–42	Microscopy, Plant Cells
1/27	The Plant Cell–2; Cell division		
1/30	Cell Development	7–16	
2/1	The Cell Wall	43–60	Cell development, Cell walls
2/3	The Cell Wall–2; Parenchyma	61–65	
2/6	Parenchyma–2		
2/8	Collenchyma	65–70	Parenchyma, Collenchyma
2/10	Sclerenchyma	71–82	
2/13	Epidermis	83–96	
2/15	Epidermis–2		Sclerenchyma, Epidermis
2/17	Xylem	101–122	
2/20	Xylem–2		
2/22	Phloem	157–180	Xylem, Phloem
2/24	Secretory structures	199–212	
2/27	Secretory structures–2		
3/1	Review of material		Secretory structures
3/3	No classes—Texas Academy of Science meetings		
3/6	Lecture Exam 1 (Introduction to Secretory structures)		
3/8	Primary stem structure	257–260	Lab Exam 1
3/10	Walk		
3/13	Spring Break, No Classes All Week		

Date	Lecture topic	Reading	Laboratory
3/20	Primary stem structure & development	271–291	
3/22	Primary stem development		Stem structure, apical meristems
3/24	Leaf structure & development	321–347	
3/27	Leaf development; Leaf variations	351–372	
3/29	Leaf variations–2		Leaf structure, leaf variations
3/31	Primary root structure	215–227	
4/3	Root structure; Root development	227–239	
4/5	Root development–2		Root structure, apical meristems
4/7	Review of material		
4/10	Lecture Exam 2 (Xylem to Primary root development)		
4/12	Secondary xylem	101–111 125–142	Secondary xylem
4/14	Secondary xylem–2		
4/17	Vascular cambium	145–154	
4/19	Secondary phloem & periderm	172–196	Vascular cambium, Phloem & periderm
4/21	Anatomy of fossil plants	Handout	
4/24	The flower	375–401	
4/26	Angiosperm life cycle	403–427	Fossil plants, flowers
4/28	Embryos and seeds	455–498	
5/1	Lab Exam 2 (Primary stem structure to flowers)		
5/5	FINAL EXAM (comprehensive), 8:00—10:30 A.M., Friday.		

Anatomy of Vascular Plants
Dr. Upchurch
Spring 2006

Biology 4412
Office: 338 SUPPLE
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Office Hours

11:00-11:50 a.m. MWF (After lecture)

By appointment, or just drop by!

General Policies

Biology 4412 provides an overview of tissue and organ structure in vascular plants, with an emphasis on cell types and development. The student gains a working knowledge of plant anatomy through lectures and laboratories.

Plant anatomy forms part of a larger discipline known as comparative biology. Comparative biology couples the observation of different organisms with the generation of testable hypotheses to understand constructional principles and evolutionary relationships. Our class focuses on three areas:

- 1) Observing cells and tissues in diverse plant groups,
- 2) Describing their variation,
- 3) Explaining tissue and organ structure in terms of ecological, physiological, and developmental principles.

Rather than setting up experiments, like a plant physiologist or cell biologist, plant anatomists observe nature's experiments and derive principles to explain the variation that they see. A course in plant anatomy provides a conceptual framework and observational skills for use in a variety of botanical sub-disciplines, including paleobotany (my specialty), plant systematics, plant development, and biomechanics. Plant anatomy provides important data to these basic research fields and to applied fields such as horticulture, agronomy, forestry, and wood technology.

Textbooks

Two textbooks are used in this class.

Anatomy of Seed Plants, Edition 2, by Katherine Esau (required)

Laboratory Exercises for Biology 4412/5412, Plant Anatomy, by Garland Upchurch (required—individual labs can be printed out from Blackboard)

Course Organization

Each week consists of three 1-hour class periods and one 3-hour laboratory. The lecture provides an overview of material covered in the book and laboratory. **Please read your text and any other relevant material before coming to class. This is essential to understanding the material.**

The best reading strategy is as follows. Before lecture: 1) read the introduction section of the relevant laboratory exercise for an overview, and 2) read the assigned pages in the text. Shortly after lecture: 3) re-read the assigned pages of the text. Please bring your lecture text to lab to help develop the connection between the reading and laboratory material.

Each lecture period is divided into a series of mini-lectures. Each mini-lecture is interspersed with one or more questions that I will ask the class. Sometimes the questions will comprise recall of material from your readings or a previous lecture. Other times the questions will comprise material for thought to help you will conceptualize the material in a new way. This strategy breaks up the monotony of a long lecture and better engages you in the learning process.

During the first two weeks I will ask you to choose one or more learning partners. Your learning partners will serve as a sounding board for ideas and discussion.

In order for this method to work, you must come to class prepared. Please keep up with the assigned readings! Do not neglect the assigned readings until just before the test. This will create a number of problems, including a lower course grade.

Each laboratory section is three hours long and usually consists of two laboratory exercises separated by a 10-15 minute break. During the break you will have the opportunity to walk around and ingest various mind-altering chemicals that enhance intellectual performance (e.g., sugar and caffeine). Food and drink are **not** allowed in the laboratory.

Each laboratory exercise is designed to illustrate lecture material and develop your ability to interpret anatomical structure. Most laboratories can be completed within the normal class period. Students who need additional time are welcome to work at other times during the day or evening, provided that someone (the IA or myself) is present to open and lock the lab. (I encourage extra work.) If most students cannot finish a lab on a given class day, the beginning of the next lab period might be devoted to that lab.

People should choose a lab partner during the first laboratory period. If at all possible one lab partner should be a graduate student and the other an undergraduate. The student with little background will have the help of someone more experienced, while the more experienced student will reinforce his/her knowledge by helping someone less experienced.

Blackboard

My blackboard site contains the course syllabus, laboratory exercises, study questions, a sample exam, an image library, and one or more papers of interest. Quizzes will not be given on blackboard but instead be given at the beginning of each lab period.

The syllabus should be used to plan your readings and to review study strategy.

The laboratory exercises are only available on blackboard. Please print out and read each laboratory exercise well in advance of the Tuesday afternoon lab.

The study questions should be used to organize your study well in advance of the hour exams and final. After study you should understand the material well enough to define terms, explain basic concepts in your own words (including essay format), and draw structures.

A sample exam is provided to show you the examination format.

The image library provides a supplement to the materials provided in lab; **it is not intended to be a replacement! This means that you need to carefully observe and draw materials in lab** as well as use the image library. The image library simply gives you extra images so that you can better understand anatomical structure and its variation in seed plants.

Examinations

The course has weekly quizzes over lecture and lab material, two lecture exams, two lab practical exams, and one comprehensive final. The weekly quizzes consist of short answer. **These quizzes are administered during the first ten minutes of each lab period.** The purpose of the weekly quizzes is to help you remember factual detail and to encourage you to keep up with the lectures and assigned readings.

The hour-long lecture exams and final exam are short answer, fill in the blank, draw & label, and essay. Well before Lecture Exam 1 you will receive a guide on studying for essay exams and writing essays. In brief, you should start studying two weeks before the exam and organize your thinking along major conceptual lines.

The lab exams are in practical format and cover material that you observed during the previous weeks' laboratories. These lab exams require you to recognize material through the microscope and answer questions regarding its structure and function. The first lab exam is given during a lab period, while the second lab exam is given during the last lecture period.

Students always ask whether I expect them to remember the genus and species of material that they observed in lab. **The answer is no!** The purpose of the lab material is to demonstrate important concepts in plant anatomy, rather than teach identification. In this respect my course in plant anatomy is very different from courses in plant taxonomy or Texas flora. Having said that, I do expect for you to recognize the differences between conifers, monocots, and dicots.

My tests are generally thorough and require recall of most presented material. Some exam questions may ask for details that are covered in the text but not lecture. However, the majority of exam material comes directly from lecture and lab.

The final exam is a bit different from the hour exams. In the final exam, you are required to take material that you learned in the course and apply it to new situations. Plant Anatomy has a practical side, and some of the exam questions will require you to use your knowledge in practical situations. For example, I might tell you that an archeologist has recovered a piece of wood from an excavation, then ask how you would tell whether it was a conifer, dicot, or monocot.

The exams are scored as follows:

Weekly quizzes (12 or 13)	100 points
Lecture exam 1	100 points
Lecture exam 2	100 points
Lab exam 1	100 points
Lab exam 2	100 points
Class participation	50 points
<u>Final exam</u>	<u>200 points</u>
Total	750 points

The final grade is out of a total of 750 points. Each student's points will be converted to a percentage before assigning grades.

Grades are assigned according to the following guidelines.

$\geq 90\%$	=	A
80-89%	=	B
70-79%	=	C
60-69%	=	D
<60%	=	F

Final grades will not be posted. I will send you a copy of your final grade if you provide me with a stamped, self-addressed envelope. I cannot give out final grades over the telephone (Texas State Law).

Important dates

Below are some important dates in case you decide to drop the course.

February 1: Last day to drop with no record on your transcript and a refund.

February 3: Last day to drop with an automatic W.

April 20: Last day to drop the course (ends at 5 pm).

If you decide to drop I can decide to give you a grade of "F" if failing. Please see me if you are thinking about dropping the course.