

**BIOLOGY 202**  
**PLANTS AND HUMAN AFFAIRS**  
SEC. 202-1: CRN - 30995  
Credit Hours: 4  
Spring 2015



1. Rice, mother, and child from ancestral figurine. Igorot, Philippines.
2. Wheat (emmer) from harvest scene, Egyptian tomb mural.
3. Maize from Mexican maize goddess.
4. Sorghum. Mask of pretty woman, Angola.

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**Instructor information**

Dr. Ross A. McCauley  
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Office hours: MWF 10:00-11:00 AM; W 12:30-3:30 PM and by appointment

**Course information:**

**Meeting time and place:** Lecture MWF 9:05-10:00 AM, EBH 107; Lab T 1:25-4:30 PM, Berndt Hall 440

**Course Description:**

Plants play an integral role in shaping both the world we live in as well as our own human cultures. This course will explore both the basic biology of plants and our utilization of them for food, materials, fuels, medicines and use for social purposes. Our study will increase your appreciation of the important role that plants play in the world - a view that is often overlooked.

**Objectives:**

- Understand the basic structure and function of flowering plants.
- Develop a basic understanding of biological organization at the organismal level (cells, tissues, organs, etc.).
- Understand the basics of energy acquisition (photosynthesis) and energy use (respiration) using plants as a model system.
- Gain an appreciation for the many uses of plant biodiversity by human societies, both past and present.
- Investigate the origin of agriculture and the major crop plants which provide us with the majority of our calories.
- Understand how modern biotechnology is being used in the breeding and growth of crop plants.
- Consider how many different cultures have viewed and interacted with plants in very different ways from our technological society
- Recognize the important contribution that both fungi and algae serve for food and the effects they have had on human societies throughout history.
- Gain an appreciation for a myriad of common plant products ranging from coffee to medicines and an understanding of how they are derived.
- Illustrate an awareness of science topics in the media related to the interaction of humans and plants.
- Gain experience with the core skills of a scientist (observation, analysis, measurement, classification, inference and prediction) through guided laboratory exercises.

**gtPathways Course Criteria and Student Outcomes**

Bio 202 is a course certified for guaranteed transfer among other Colorado Colleges and Universities. Thus it must meet a select group of criteria as follows.

- 1) Develop foundational knowledge in specific field(s) of science.
- 2) Develop an understanding of and ability to use the scientific method.
- 3) Recognize that science as a process involves the interplay of observation, experimentation and theory.
- 4) Develop quantitative approaches to study natural phenomena.
- 5) Identify and highlight interconnections between specific science courses being taught and larger areas of scientific endeavor.
- 6) Distinguish among scientific, nonscientific, and pseudoscientific presentations, arguments and conclusions.

The lab portion must meet a separate group of criteria as follows.

- 1) Develop concepts of accuracy, precision, and the role of repeatability in the acquisition of scientific data.
- 2) Be predominately hands-on and inquiry-based with demonstration components playing a secondary role.
- 3) Emphasize a student's formulation and testing of hypotheses with scientific rigor.
- 4) Stress student generation and analysis of actual data, the use of abstract reasoning to interpret these data, and communication of the results of experimentation.
- 5) Develop modern laboratory skills.
- 6) Emphasize procedures for laboratory safety.

Additionally all gtPathways science courses are expected to provide students the ability to develop specific competencies. These include...

- 1) Critical Thinking, in which students become capable of critical and open-minded questioning and reasoning based on an understanding of an argument. The student should be able to examine issues and ideas and to identify good and bad reasoning in a variety of fields with differing assumptions, contents and methods.
- 2) Mathematics, in which students gain the ability to use mathematical methods, reasoning and strategies to investigate and solve problems.

#### Required text :

Levetin, E. and K. McMahon. 2012. Plants and Society, 6<sup>th</sup> ed. McGraw Hill, New York.  
ISBN 978-0-07-352422-1

Additional readings from other sources will also be assigned and will be provided on Canvas.

#### Course Website:

Canvas via <https://courses.fortlewis.edu/>

The course website contains all of the course lecture materials and copies of all laboratory exercises, additional readings, and updates to the schedule. I will also upload at the appropriate time review sheets for all exams approximately one week before the exam.

#### Course Evaluation:

Grades will be determined through a mix of three exams, laboratory exercises, assignments, and a group research presentation. The distribution of the grades will follow the very approximate percentages:

Exams	40%
Laboratory Assignments/Reports	20%
Research presentation	20%
Other Assignments	20%

Your grade will mostly be a sum of the earned points you have accrued throughout the semester with the following exceptions. Make-up lecture exams may be scheduled within 5 days of the original exam date ONLY in the case of a legitimate absence. Legitimate absences will include any absence with a letter documenting that absence from the appropriate college official, be a documented medical excuse, or be a documented religious observance. If you miss an exam for a legitimate reason and are unable to make up the exam within 5 days the score on the final exam will be substituted for the missed exam score. If you miss for an illegitimate reason then you will receive a zero for that particular exam. A late penalty for assignments will be a reduction of 5% of the total grade per 24 hour period (this includes weekends).

#### Grading Scale by %

A	94-100	C+	77-79
A-	90-93	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C	73-76	F	0-59

The above grading scale will be followed however I will round your final percentage depending upon your class attendance and participation.

## Course Structure and Specific Requirements

### Laboratory:

We will use the laboratory time to complete a variety of exercises to increase our understanding of both plants and the products we get from them. Some of our labs will focus on the examination of basic plant structure to better understand the functioning of common plant parts including roots, stems, leaves, and flowers. Others will focus on more experimental investigations including the determination of nutrient content of common foods, the search for specific genes associated with genetically modified foods, and a bioassay to identify chemically active compounds in common herbal remedies. We will have a few labs toward the end of the term in which we will learn a few of the common useful plants of our region. We will use a variety of common scientific tools and techniques including simple observation and classification, microscopy, bioassays, and molecular biology.

All labs will require you to make drawings, answer questions, and/or make general conclusions based upon your observations or collected data. A few labs will focus on a hypothesis-based investigation of a particular question and thus require the formulation of specific hypotheses which can then be tested. Grades for all laboratories will be based on your participation in the exercise and your completion of the appropriate materials at the end of the laboratory exercise. Some small laboratory write-ups will be required to give you practice expressing scientific material in written form.

### Media/Current Science Assignment:

You will be required to find and summarize four different articles or reports in the popular media that are related to the use of plants by people for food, medicine, shelter, or for ecological services they may provide. You can choose which articles you read with the only stipulation being that all four articles cannot be on the same topic. For each summary you will be required to write at least two type-written pages which should include a citation to the article, a short synopsis of the article and a personal response to the article stating your stance toward the issue. These will be due at various times throughout the semester.

### Weekly Reading Questions:

Each week you will have assigned a set of questions drawn from the readings for that week. Some of these will be from your text while others will be from the supplemental readings. The questions will be designed to highlight the most important material of that week's reading. The questions will be available on Canvas and you will submit your answers via Canvas as well. The questions will be available for approximately one week and there will be no late submissions accepted. You will be allowed to miss one of these assignments.

### Useful plant research presentation:

The presentation is an opportunity to study in-depth and share with the class a topic of interest regarding the relationship that people have with the plant kingdom and the products produced from it. This may be a detailed survey of 1) an individual species of plant and its important products or interactions with man, 2) an agricultural or related process and its importance to our survival or economy, or 3) an issue of local or world scale centered on the plant kingdom.

For this assignment you will work with a partner to research and prepare a 10 minute PowerPoint presentation which will be presented to the class during one of the designated class periods following Spring Break. I will provide additional information later regarding specific instructions regarding format however you should begin to think about a topic which would be of interest. You will need to have your topic approved by me prior to beginning your research and each group of two will be required to have a unique topic. This proposal will be due Monday February 9.

### Since I know someone will ask...

**How can I pass this class? I am NOT a scientist and I've never done well in science.**

My Answer:

- Attend all class sections and lab. Students who don't come to class, don't pass
- For every hour of class, you should study for two hours at home reviewing the material—yes, I said two hours.
- Do not fall behind—almost every class is a new topic.
- Check for study materials, assignments, and updates to the schedule on Canvas.
- Read the book and download the Powerpoint lecture before you come to class – most lectures will be available before class on Canvas (note – Powerpoints alone will not cover all material discussed in class).

- Come and see me in my office if you are “lost.” You are not the first student to not understand something, so there is no need to be afraid or embarrassed. Students do not take advantage of this opportunity as much as they should.

## **Course policies**

### **Academic Integrity:**

The Biology Department upholds College policy on Academic Integrity. Therefore, students who commit acts of academic dishonesty (a.k.a. cheating, copying, plagiarizing):

1) on homework or other less major assignments, will receive a ZERO on the assignment in question, and will be reported to Academic Affairs.

2) on exams, major papers or reports will earn a ZERO and be automatically removed from the COURSE, and will be reported to Academic Affairs.

Any student who accumulates two reported incidents of dishonesty with the Academic Affairs office will have a formal hearing with the Academic Standards Committee and faces academic dismissal from the College.

### **Attendance:**

While I do not take a daily role, regular attendance is expected – particularly if you want to do well. I will try to post much of our class material on Canvas however this may not always be possible as all course materials may not be easily converted to digital format. If you know you are going to miss class please let me know beforehand. If your absence results in your missing a quiz or exam, and is legitimate, the aforementioned policy stands.

### **Classroom conduct:**

While I hope it goes without saying, please respect the rights of myself and your fellow classmates. If you are late try not to disturb everyone else. Additionally please leave mobile phones, pagers, iPods, etc, at home or turn them off and keep them stowed during class. There is no need for you to keep your phone next to you on your desk during class time. I will not allow texting or checking of messages on any electronic device during class time. If this becomes a problem you will be asked to forfeit your device. Such activity is not only very disrespectful but also interferes with your ability to learn.

### **Biology Laboratory Safety Rules and Procedures:**

Everyone in the biology lab must follow these safety rules and procedures.

- It has been said that “common sense isn't very common.” Please use common sense to keep yourself and classmates safe, and the laboratory running smoothly. You are each responsible for maintaining the cleanliness and safety of the lab.
- No food or drinks are allowed during a lab session. The only exception is food or drink provided by the instructor as part of the laboratory.
- Only closed-toe shoes are to be worn in the lab. Open-toe sandals are not permitted.
- Keep hands and other objects away from your face, nose, eyes, ears, and mouth. Do not apply cosmetics while in the lab.
- When working with bacterial cell cultures, work areas/surfaces should be wiped down with disinfectant before and after lab use.
- Hands should be washed after handling bacteria and before leaving the laboratory.
- Laboratory coats are optional. They do protect your clothing from stains and reagents.
- When working around open flames from a Bunsen burner, long hair should be secured behind your head.
- Be careful around Bunsen burners. Flames cannot always be seen.
- All unnecessary books, purses, briefcases, etc., should be kept off the countertops during lab work.
- Never pipette anything by mouth (including water). Use pipetting devices.
- Label all materials with your name or initials, date, and any other applicable information (e.g., type of media, organism, etc.).
- When handling chemicals, note any hazard codes or warnings on the container and take the appropriate precautions indicated.
- Do not pour chemicals down the sink without first checking with your instructor.

- Do not pour culture media fluids with bacteria or agar down the sink.
- Return all chemicals, reagents, cultures, and glassware to their appropriate places.
- Flame transfer loops, wires, or needles (all made of metal) before and immediately after use when transferring biological material.
- Do not walk around the laboratory with transfer loops, wires, needles, or pipettes containing biological material.
- Report any broken equipment immediately to your instructor.
- Immediately report any broken glassware, especially those containing bacteria or biological material.
- Immediately report any chemical or biological fluid spills to your instructor.
- Follow all instructions given by your instructor for cleaning up any spills or broken glass.
- If you are injured in the laboratory, immediately inform your instructor.
- Always wipe and clean the lenses of your microscope before putting it away. Use the appropriate tissue paper and cleaning solution for this purpose.
- Do not remove any materials from the laboratory without permission from your instructor.
- Dispose of wastes in their proper container, there are separate containers for sharps, broken glass, hazardous materials and biohazardous materials.

#### Waste Disposal

- Dispose of items in special bags or receptacles as indicated. If you have a question regarding the proper disposal of an item, ask your instructor.
- Use a Biohazard (orange/red) bag for agar plates (plastic Petri plates) containing any biological material.
- Use a desktop plastic waste container for used plastic micropipette tips; these containers will be emptied into a Biohazard (orange/red) bag for autoclaving.
- Use a Biohazard “orange/red bag” container for contaminated cotton swabs.
- Use a Sharps container for needles, glass slides, syringes, pipettes, other types of sharps.
- Use a “Glass waste” container for broken glassware and for used microscope slides.
- Any glassware containing liquid culture medium in which bacteria have been grown must be autoclaved before disposal.
- In general, non-contaminated items that pose no threat can be disposed of by placing them in the regular trash. Any sharp object (“sharps”), contaminated or not, should be discarded into the sharps container.

(Biology department lab safety guidelines prepared by SH on August 29, 2014; adapted from:  
<http://www.as.yosu.edu/%7Ecrcooper/LabRules.pdf>)

#### **Add/Drop policy:**

The last day to add the class is census date, January 27, 2015. Prior to this date you may drop the course at anytime with no grade being recorded. College policy states that not attending the first two class meetings will result in automatic disenrollment.

The last day to withdraw from FLC classes with a grade of “CW” (course withdrawal) is 4 pm Friday, March 6, 2015. This is a college-wide deadline that is not negotiable.

To withdraw from this course, go to the Registrar’s Office, Room 160, Miller Student Services Building before the course withdrawal deadline. They will help you through the process. You do not need my signature on the course withdrawal request form.

Starting Fall 2013, students have a life-time limit of three individual course withdrawals from FLC courses. If you have withdrawn from classes before Fall 2013, these will not count towards your lifetime limit. Also, withdrawing entirely from a semester (all classes) does not count against your lifetime “CW” limit. Semester withdrawal is handled under a different policy and procedure. Please refer to the Academic Policies section of the Fort Lewis College Catalog of Courses for more information about course and semester withdrawal policies and procedures.

#### **Accommodations:**

Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with the Disability Services Office. If you qualify for services through the Disability office,

bring your letter of accommodations to me as soon as possible so I can make the appropriate arrangements. Letters are available through Dian Jenkins, Coordinator of Disability Services, 280 Noble Hall, 247-7459.

### Tentative Lecture/Lab Schedule

Wk	Date	Topics	Readings/Assignments
1	Jan. 12/14/16	<b>Theme I: Introductory Plant Biology</b>	
	Lecture	M: Intro – The History of Chocolate W: Importance of the “Green World” F: The nature of scientific knowledge	P & S Chap. 1 <b>HW: Plants in Our Lives</b> Stephens and Dudley “ <i>The Drunken Monkey Hypothesis: the study of fruit-eating animals could lead to an evolutionary understanding of human alcohol abuse</i> ” – <b>read for Friday</b> Ford, B. “ <i>Critically evaluating scientific claims in the popular press</i> ” <b>HW: Reading Questions</b>
	Lab	Video: Botany of Desire	
2	Jan. 19/21/23		
	Lecture	M: The cellular basis of plant structure W: Plant architecture F: Metabolism I: Photosynthesis – why the green world is green	P & S Chap. 2, 3, 4 <b>HW: Reading Questions</b>
	Lab	Plant architecture - cells, tissues & organs	
3	Jan. 26/28/30		
	Lecture	M: Metabolism II: Respiration and energy use W: Plant life cycle I: Sex - Saying it with flowers F: Plant life cycle II: Reproduction - fruits and seeds	P & S Chap. 5, 6 <b>HW: Reading Questions</b> <b>M: Media Assignment I Due</b>
	Lab	Flowers, Fruits & Seeds	
4	Feb. 2/4/6		
	Lecture	M: Evolution of Plant Diversity W: Catch up/Review <b>F: Exam 1</b>	P & S Chap. 9
	Lab	Pollination Biology	
5	Feb. 9/11/13	<b>Theme II: Plants as Food</b>	
	Lecture	M: Human nutrition W: Origins of agriculture: gatherer/hunters vs. agriculturalists; domestication <b>F: No class - Biology Department Advising</b>	P & S Chap. 10, 11 Diamond “ <i>Guns, Germs, and Steel: Chapter 6: To Farm or Not to Farm</i> ” <b>HW: Diversity of your food</b> <b>HW: Reading Questions</b> <b>M: Presentation topic proposal due</b>
	Lab	Your piece of the sun – Personal food web and nutrition	
6	Feb. 16/18/20		

	Lecture	M: Selection – Evolution of modern crop plants W: Grains: bread, beer, & breakfast F: Legumes: peas, beans, & peanuts	P & S Chap. 12, 13 <b>HW: Reading Questions</b> <b>M: Media Assignment II Due</b>
	Lab	Video: King Corn & Grasses	
7	Feb. 23/25/27		
	Lecture	M: Starchy Staples W: Basics of plant nutrition F: Growing food vs. growing fuel	P & S Chap. 14, 15 Wald “ <i>Is Ethanol for the Long Haul?</i> ” - <b>read for Friday</b> <b>HW: Reading Questions</b>
	Lab	Beans and potatoes	
8	Mar. 2/4/6		
	Lecture	M: Breeding for crop improvement – traditional methods W: Biotechnology and GMOs F: GMO case study	P & S Chap. 15 <b>HW: Reading Questions</b>
	Lab	Genetically modified foods I	
9	Mar. 9/11/13		
	Lecture	M: Crops of the future - Issues facing agriculture W: Catch up/Review <b>F: Midterm Exam</b>	Vandana Shiva on <i>The Problem with Genetically Modified Seeds</i> (Video) Norman Borlaug “ <i>Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry</i> ” Folger “ <i>The Next Green Revolution</i> ”
	Lab	Genetically modified foods II	
10	Mar. 16/18/20	<b>Theme III: Non-plant products: Fungi &amp; Algae</b>	
	Lecture	M: Important algal and fungal products W: Fermentation F: Ethnomycology	P & S Chap. 22, 23, 24, 25 <b>HW: Reading Questions</b> <b>M: Media Assignment III Due</b>
	Lab	Everyday algae and fungi	
<b>Spring Break!</b>			
11	Mar. 30/Apr. 1/3	<b>Theme IV: Secondary Compounds in Plants</b>	
	Lecture	M: What are secondary compounds and why do plants have them? W: Coffee & Tea F: Student Presentations	P & S Chap. 16 <b>HW: Reading Questions</b>
	Lab	Bioassay of common herbal remedies I	
12	Apr. 6/8/10		
	Lecture	M: Herbs and spices: exploration & imperialism W: Video: The Shaman's Apprentice F: Student Presentations	P & S Chap. 17, 19 <b>HW: Reading Questions</b> Sherman & Flaxman “ <i>Protecting ourselves from food</i> ”
	Lab	Bioassay of common herbal remedies II	

13	Apr. 13/15/17		
	Lecture	M: Medicinal Plants W: Psychoactive /Poisonous Plants F: Student Presentations	P & S Chap.19, 20, 21 <b>HW: Reading Questions</b> <b>M: Media Assignment IV</b> <b>Due</b>
	Lab	Basic plant identification (outside)	
14	Apr. 20/22/24		
	Lecture	M: Student Presentations W/F: Wrap up	
	Lab	Identification of local useful plants (outside)	
15	<b>Tues. Apr. 28</b>	<b>Final Exam 7:30 – 9:30 AM</b>	