

Syllabus for Lecture
BIOL 2002 – Plant Form & Function – Fall 2015

Root Gorelick Tory 360 (“the egg”) Tuesday/Thursday 11:35 am – 12:55 pm

Contact Information and Office Hours

Phone – 613-520-2600 ext 1586 (warning: I am horrible about checking voice mail)
E-mail – Use CULearn e-mail (otherwise your e-mails may get tagged as ‘junk’)
Office Hours – Thursday from 1:00 -2:30 pm (or by appointment)
Office – 4625 CTTC (just south of the gym and child care)

Prerequisites: BIOL 1003 and 1004 or BIOL 1103 and BIOL 1104.

Required Texts

1. Bryan G. Bowes and James D. Mauseth (2008) *Plant structure: a colour guide* (2nd edition). Jones & Bartlett.
2. R. Larry Peterson, Carol A. Peterson, and Lewis H. Melville. (2008) *Teaching plant anatomy through creative laboratory exercises*. NRC Press.
3. Claudia Buttera (2015) *Plants: form and function lab manual*.

Preamble

Biological form and function can be studied from the perspective of growth and survival, as well as the perspective of reproduction. Thus the first half of term in lecture will be devoted to study of vegetative parts of plants, while the second half will be largely (but not exclusively) devoted to reproduction. This course will be an introduction to the varied architectural alternatives that plants have evolved with respect to both form and function of growth and sex.

Most plants that are useful to humans are flowering plants, so we will spend more time studying them. These range from foods (is a tomato or potato a fruit or vegetable?) to wood (for paper, lumber, fuel) to medicines to how maple trees make maple syrup. Extinct spore-bearing plants were also major sources for coal. Sphagnum peat moss is an important constituent of many ecosystems, especially here in Canada, and is a fuel source for many humans. You will learn the many ways that these seldom studied plants have stumbled upon novel solutions to growth and reproduction. You will never think of wood or sex in the same way after this course. Plants are much more interesting and diverse than you probably ever imagined.

Course objectives

1. Appreciation and awareness of plant vegetative and reproductive parts.
2. Understanding how engineering, ecology, and evolution affect plants.
3. Develop logic and marshal sufficient facts to be able to link plant form with function, and vice versa. You should also be able to detect when adaptive arguments are bogus.
4. Greater awareness of the natural world and its variation (exceptions often prove the rule); become more anti-essentialist.
5. Critical thinking and coherent writing.

“The **way** we approach the challenge of learning will shape us as much as **what** we seek to learn.”
(Taiaiake Alfred 2005: 199; italics in original)

Notes:

1. This syllabus only covers the lecture portion of the course. Your superb lab coordinator, Claudia Buttera will provide details regarding the lab.
2. I cannot legally provide you with electronic copies of lecture slide containing copyrighted material. Given that most of the lecture slides are pictures, it is incumbent on you to do the following three things. First, come to lecture and pay attention. Second, interrupt me in lecture, especially asking me to draw pictures using chalk. Third, study and ask me about the pictures in the coloured atlas by Bryan Bowes and Jim Mauseth. Also see page 7 of this syllabus regarding “note taking and sharing” for other possibly useful ideas.

Relationship of Lab and Lecture

You will receive one grade for the course, combining both the lab and lecture. Please see the lab coordinator, Claudia Buttera, for details about the lab.

The lecture will cover the material with great breadth, while the lab will cover the material with great depth. In lecture you learn about plant architecture in all multi-cellular land plants (Embryophyta, which include at least a dozen different living divisions, sometimes referred to as phyla). In order to do this subject justice, we will NOT cover green and red algae, although they could be considered plants. Because lab is largely devoted to flowering plants, we will cover these first in lecture. They provide a nice baseline before delving into oddities of other plant groups.

Summary of Course Grades

Lecture – 60 %, comprised of:

- 15 % 1st Mid-Term Exam (8 Oct 2015)
- 15 % 2nd Mid-Term Exam (17 Nov 2015)
- 20 % Final Exam (Dec 2015; minimum allowed score is 8 of 20)
- 10 % Written assignments (2.5 points each) throughout term

Lab – 40 % See lab coordinator for details

Mid-Term Exams

There will be two mid-term exams, on Thursday 8 October and Tuesday 17 November 2014. Mark these on your calendar, **now**. Each exam will be worth 15 % of your final course mark.

There will not be make-up exams for either mid-term, unless extremely extenuating circumstances arise and you provide me with persuasive documentation in an extremely punctual fashion, i.e. within 48 hours of your resumption of classes or sooner if you have e-mail or phone access. Otherwise, you will receive a mark of zero for the missed mid-term exam. Automotive failure or heavy traffic will not count as a valid excuse for missing an exam. Make sure you leave home or work for school early on those two days.

I will NOT pro-rate any exams. In the highly unlikely event that I give a make-up exam, I reserve the right to make the format of the exam different (i.e. not necessarily multiple choice), although the material being tested will be largely the same.

You will not be allowed to start the mid-term exams after 12 noon. You must hand in your mid-term exams no earlier than 12 noon and no later 12:55 pm. Violation of either rule is enforceable with a mid-term grade of zero for that exam.

Mid-term exams will be multiple choice with scantron forms, so bring a suitable pencil and eraser.

Final Exam

The final exam will count for 20% of your mark. The final exam will be comprehensive. You must obtain a score of at least 40%, i.e. at least 8 of 20, on the final exam in order to pass the course. Final exam scores of lower than 8 out of 20 will result in a course mark of F. The final exam will be partly or entirely multiple choice with scantron forms, so bring a suitable pencil and eraser, and possibly partly written essay questions akin to the 2.5 point assignments.

The final examination will be scheduled during the regular examination period, i.e. in mid December 2015. It is your responsibility to be present during this period. Therefore, your winter travel arrangements must not be made before the registrar announces the final examination schedule.

Deferred exams are generally only granted to students who cannot take the regularly scheduled exam *due to illness*. Students must present a doctor's note to the registrar using the Carleton University Medical certificate (<http://www.carleton.ca/registrar/forms.htm>) within five working days of the date of the final exam. The deferred exam replaces only the final exam portion of the marks, and students must have completed satisfactory term work to be granted this privilege. The date and time for the deferred exam will be determined by the registrar. Determination of whether you are eligible for a deferred final exam will also be made by the registrar.

Classroom decorum

I strongly encourage you to speak up and participate both in lecture and out of lecture, albeit in a respectful manner. In lecture, pretend that you are a courtroom lawyer. Your job is to advocate on your own behalf. Please don't forget that you are co-equals with each of your hundred or more colleagues in class.

Academic Integrity Policy:

The University is committed to ensuring fairness and consistency in the completion of examinations, including quizzes. As part of this commitment, students are required to follow proper examinations procedures. A student who commits a violation of this policy on an examination, test, or take-home examination, or obtains or produces an answer or unfair advantage by deceit, fraud, or trickery, or by an act contrary to the rules of the examination are subject to the sanction under this Policy. These rules include but are not limited to:

- attempting to read any textbook, notebook, memorandum, other written material or mechanical or electronic device not authorized by the examiner;
- writing an examination or part of it, or consulting any person or materials outside the confines of the examination room without permission to do so;
- leaving answer papers exposed to view;
- attempts to read other students' examination papers and/or speaking to another student (even if the subject matter is irrelevant to the test).

Writing assignments

When this course is over, virtually none of you will use the detailed botanical facts that you memorise for the exams. One of my objectives is to encourage you to develop general skills that will be useful long after graduation. Almost any professional job you obtain following graduation will require critical thinking and coherent writing. Therefore we will try to develop these skills by answering questions about plant form and function.

Five times during the term, I will announce a short assignment during class. I shall drop the lowest mark, i.e. only your four highest marks for written assignments will count. The assignments will also be announced via CULearn. During the first week, we will start with a sixth such assignment that will not count towards your grade, but exists to get you accustomed to the style of questions and the mechanics of the process, i.e. the intricacies of CULearn.

You should be able to complete all but one of these assignments without anything except your lectures notes and, more importantly, your brain. I will provide all necessary background information. One assignment may require you to examine live plants during the lab period. I will devise questions that you cannot look-up in books or on the internet, so don't bother with these sources unless I specifically encourage it. In fact, the internet will usually lead you astray.

Please review any instructions we post on CULearn and pay close attention to any suggested grading scheme before submitting your answers. You must turn-in your assignment via CULearn. Unless otherwise stated, submissions must be made by 5:00 pm two days after the lecture in which the question was assigned. *There will be no make-up assignments or extensions unless there is a documented CULearn outage.* That is why only your four highest marks will be used to compute your course mark, thereby accounting for possible exigencies.

The assignment you turn in must be your own work in your own words. If two or more people have effectively the same answers, I will send your papers to the dean for adjudication of possible plagiarism. Transcription of somebody else's written or spoken words without quotation marks or without citation to the original source constitutes plagiarism. Failure to include quotation marks (or other distinguishing marks) and a full citation constitutes a *prima facie* violation of the university's academic integrity policy, which will be immediately referred to the dean for adjudication. Copying of someone else's words but then substituting half of the words therein also constitutes a *prima facie* case of plagiarism. See the *Guardian's* hilarious article about "sinister buttocks" ([here](#)) for what this might entail, and note that this still would be sent to the dean as a presumptive case of plagiarism.

While these assignments are only worth 10 % of your final grade, they nonetheless constitute an essential part of this course. Have confidence in your abilities and take pride in your answers.

Four keys to success in class:

Read and understand Mike Dorf's brilliant 23 August 2010 *FindLaw* column ([here](#)).

Although written about law school, Mike Dorf's article is applicable to any university course.

CULearn – Electronic Communication:

BIOL 2002 will be managed with CULearn system: <https://carleton.ca/culearn/>

You must have a computing account to access the course CULearn webpage.

At a minimum, we will be using the following five features of CULearn:

Notices – I will post updates and information about the course on the CULearn course home page, so be sure to check it regularly.

Course e-mail – CULearn has an e-mail account specific to each course that is accessible only to students registered in the course. I will send individual messages and course notices using the CULearn e-mail, so check your account frequently. Use this method for course-related e-mails and not my other e-mail accounts. Also contact the lecture TAs via CULearn e-mail.

NOTE: Your e-mails must be formal, polite, and proofread in order to guarantee a response from me. I reserve the right to ignore e-mails that are filled with spelling and grammatical errors. Use the automatic spelling and grammar checker, possibly cutting-and-pasting from a word processor. I reserve the right to ignore e-mails that address me only by my first name or otherwise appear overly colloquial. You are here to learn, which includes learning how to effectively communicate with those who evaluate your work.

Grades – I will post mid-term grades on CULearn. For your grades to be posted and for you to access the course CULearn webpage, you must be registered for this course and have a computing account. You will then have access to your grades and not to anyone else's. Note, an incorrect or missing student ID number on scantrons will result in your exam grades not being posted on-line.

Assignment grades will be posted on CULearn, although not as rapidly as mid-term exam grades.

Appeals of grades must occur via CULearn e-mail within one week (7 calendar days) of the date that the grades were first posted on CULearn.

Final exam grades will NOT be posted on CULearn because approval of final course grades by the department chair and dean are required per university rules. Once the registrar releases final course grades, you are free to ask me about final exam grades.

Assignments – Your five 2.5-point written assignments must be submitted via CULearn, where detailed instructions will eventually be found, including a grading scheme, as an addendum to this syllabus.

Requests for Academic Accommodations

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. See the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://carleton.ca/equity/accommodation>.

For Students with Disabilities:

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the deadlines published on the PMC website.

For Religious Obligations:

Students requesting academic accommodation on the basis of religious obligation should make a formal, written request to me for alternate dates and/or means of satisfying academic requirements. Such requests should be made during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist, but no later than two weeks before the compulsory event. Accommodation is to be worked out directly and on an individual basis. I will make accommodations in a way that avoids academic disadvantage to the student. For more details, see Carleton Equity Services "Student Guide".

Students who have questions or want to confirm accommodation eligibility of a religious event or practice may refer to the Equity Services website for a list of holy days and Carleton's Academic Accommodation policies, or may contact an Equity Services Advisor in the Equity Services Department for assistance.

For Pregnancy:

Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a *letter of accommodation*. During the first two weeks of class or as soon as possible after the need for accommodation is known to exist, the student must write to me with any requests for academic accommodation.

Science Student Success Center

The “Science Student Success Centre” in Herzberg Building offers help to all science students, from helping to secure summer jobs, to improving chances at getting accepted to medical school, to helping learn how to improve grades in Carleton science classes. Events include orientation workshops, mini-conferences, science-related events, and one-on-one mentoring.

Voice: 613- 520-2600 ext 3111

Email: sssc@carleton.ca

URL: www.carleton.ca/sssc

Lecture TA

Beatriz Lujan Toro will be the TA for lecture and will be responsible for the five 2.5-point writing assignments. She should only be contacted via CULearn e-mail.

Note Taking and Sharing

See the following link ([here](#)) for great ideas on taking and sharing your own class notes, that recommends **Evernote** and **Google Drive**, which I neither endorse nor disparage (i.e. “no comment”).

You are welcome to bring a laptop to lecture for note taking, but turn off (“mute”) all audio and do NOT distract your colleagues with games, movies, YouTube videos, or any NSFW content.

NRC Press Lab Manual

One of the two lab manuals is going to print-on-demand (the other lab manual will be for sale at Science Stores in the basement of Steacie Building). The bookstores may have a few copies remaining of the lab manual by NRC Press, but otherwise you will have to order a copy directly from the printer, either a paper or an electronic copy. Click on the links below to place your order and do so quickly if you want a paper copy:

Authors: R. Larry Peterson, Carol A. Peterson, and Lewis H. Melville (2008)

Title: *Teaching plant anatomy through creative laboratory exercises*.

Publisher: NRC Press, Ottawa.

Hard copies: <http://nrcresearchpress.com/doi/book/10.1139/9780660197982#.VZvdz0ZbgQs>

E-copies: <http://nrcresearchpress.com/doi/book/10.1139/9780660197982#.Vaamoqi9IA2>

Caveats

I reserve the right to alter this syllabus at any time, but promise to only do so for good cause, such as severe swine flu pandemic. If I get hit by a bus or something akin to that, whoever takes over teaching the course also reserves the right to alter the syllabus when they step in. The only time I previously altered a syllabus during middle of the term was due to a labour strike and consequent loss of a few weeks of labs.

In the highly unlikely event that you are curious about my research, much of which is botanical, and my other activities at the university, please see my website (rootgorelick.com).

Lecture Schedule – Biology 2002 – Plant Form & Function – Fall 2015

Week 1 – Introduction to plant architecture (8-10 Sept)

What is a plant? Living on dry land. A 425 million year tour. Parts needed to build a plant.

Week 2 – Roots, meristems, and stems (15-17 Sept)

Deep roots, hearts of palm, and lots of dead-wood.

Week 3 – Leaves (22-24 Sept)

Mysteries of stomatal crypts. Casting a net on venation. Can leaves work upside-down?
Funky leaves: spines, needles, and fly-traps.

Week 4 – Why do leaves change colour in autumn? (29 Sept)

Plant plumbing: Water and Septic (1 Oct)

Week 5 – Plant plumbing, continued (6 Oct) and **Exam 1 (Thursday 8 Oct 2015)**

Confounding gravity. Pipes that passively move water up. Pumps that move sugars down.

Week 6 – Maple Syrup (13-15 Oct)

Why does maple sap, with lots of sugars, flow upwards? Is this pumped or passive?

Week 7 – Wood & Bark (20-22 Oct)

Scaffolding and the lumber yard. Why is conifer wood soft? What, no annual rings?!
Why do monocots and cycads lack branches? Why bark? A menagerie of weird wood.

Week 8 – Fall Break (27-29 Oct)

Week 9 – Sex and the flowering plant (3-5 Nov)

The kinky sex of double fertilisation. Pollen as a detachable penis. Sperm dimorphism.
Does a plant need to flower to produce fruit? Panoply of sexual variation.
Cactus cephalia (the platypus of plants) may be non-adaptive, like the leaning Tower of Pisa

Week 10 – More sex: gymnosperms (10-12 Nov)

The gymnosperm misnomer: naked males or semi-naked females? Parasitic pollen.
Swimming sperm and flying pollinators. What fossils in wind tunnels tell us about sex.

Week 11 – **Exam 2 (Tuesday 17 November 2015)** and Introduction to Ferns (19 Nov)

Week 12 – Sexy ferns; monilophyte & lycophyte architecture (24-26 Nov)

Out on a limb sex. Underwater film sex. Do spores differ from pollen?
Horse-tails & club-mosses as coal. Wood as sunscreen?
Why you should like lycophytes. Was their creator a drunk plumber?

Week 13 – Moss and hornwort architecture (1-3 Dec)

Are mosses non-vascular? What minimalist designed these leaves? Aren't these roots?
How the hornwort got its horns.

Week 14 – The debut of liverworts and their ascendancy onto the haploid stage (8 Dec)

READINGS

Biology 2002 – Plant Form & Function – Fall 2015
(all ‘readings’ from Bowes & Mautheth’s colour atlas)

Week 1 – Introduction to plant architecture (8-10 Sept)
pages 73-75

Week 2 – Roots, meristems, and stems (15-17 Sept)
pages 24-26, 72-74, 81, 86-89, 106-113, 117-121, 160-161, 167, 190-211, 222-223, 258

Week 3 – Leaves (22-24 Sept)
pages 79-81, 128-152, and 224

Week 4 – Plant plumbing; Water & Septic (1 Oct)
pages 40-63, 84, 87, 90 (also glance again at the pages from week 2)

Week 5 – **Exam 1 (8 Oct 2015)**

Week 6 – Maple Syrup (13-15 Oct): No readings exist

Week 7 – Wood & Bark (20-22 Oct)
pages 14-15, 77-78, 82, 86-99, 163, 165, 170-184

Week 8 – Fall break (27-29 Oct)

Week 9 – Sex and the flowering plant (3-5 Nov)
pages 28, 229-256

Week 10 – More sex: gymnosperms (10-12 Nov)
pages 15 and 101

Week 11 – **Exam 1 (17 Nov 2015)** and Introduction to ferns (19 Nov)
pages 165 and 228

Week 12 – Monilophytes and Lycophytes (24-26 Nov)
pages 17, 165, 228

Week 13 – Bryophyte architecture (1-3 Dec)
pages 18 and 221