Biology 302 – Systematic Botany
Fall 2011

"If you do not know the names of things, the knowledge of them is useless."

Linneaus
Critica Botanica 1737

Instructor information
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Office hours: MWF 11:15 am-12:10 pm, R 9:05 am-12:10 pm and by appointment

Teaching Assistant
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Course information
Meeting time and place: Lecture MWF 12:20-1:15 pm, Theatre 105/440 Berndt; Lab W 1:25-4:30 pm., 440 Berndt Hall
Required texts:

- Murrell , Z. E. 2010. Vascular Plant Taxonomy, 6th edition, Kendall/Hunt Publishing Co., Dubuque, IA.
- Harris, J. G. and M. W. Harris. 2001. Plant Identification Terminology, 2nd edition, Spring Lake Publishing, Spring Lake, UT.
- Weber, W. A. and R. C. Wittmann. 2001. Colorado Flora: Western Slope, 3rd edition. University Press of Colorado, Boulder, CO.

Course Website: http://moodle.fortlewis.edu
I will provide on Moodle copies of material from all lectures, pertinent lab materials, review sheets and links to study resources.

Prerequisites: BIO 206 (General Botany), BIO 260 (Genetics)

Course Description
This course provides an introduction to the principles and practice of contemporary plant systematics. The goals of this course are principally two-fold: 1) Introducing the principles and methodology of modern plant systematics, including phylogenetics, classification, and molecular systematics and, 2) Learning the basics of plant identification and gaining a familiarity with important temperate vascular plant families and species found in SW Colorado.

Objectives
1. Be able to use the proper terminology for vegetative and reproductive features that are used in the identification of vascular plants.
2. Become proficient at using published keys for the identification of flowering plants.
3. Learn to recognize some of the common plant groups of SW Colorado.
4. Learn to use the proper scientific names for plant groups.
5. Gain an understanding of the relationships between evolutionary history and plant classifications.
6. Demonstrate basic knowledge and skill in using bioinformatics associated with biodiversity research.
7. Develop an ability to interpret research findings in Systematic Botany and understand how those findings contribute to the changes seen in nomenclature and botanical classification systems.

Course Evaluation
Grades will be determined through a mix of tests, quizzes, and assignments and will be distributed roughly as:

Keying Quizzes (10 pts. each)	60 pts.
Midterm lecture exam	100
Final lecture exam	100
1st practical exam	75
2nd practical exam	75
Labs	100
Plant Collection	100
Other	50
Total:	≈660

Your grade will mostly be a sum of the earned points you have accrued throughout the semester with the following exceptions. I will drop the single lowest quiz score and replace that with the highest. So if you get a 40% on one quiz at anytime and a 100% on another quiz at some other time, the 40% will be replaced by a 100%. There will be NO make-up quizzes for any circumstance. If you miss a quiz you will receive a 0% which will then become your lowest quiz score. Due to the nature of the practical exams there will be NO make-up practical exams either. If you miss an exam for a legitimate reason (see below) the score on the final exam will be substituted for the missed exam score. If you miss for an illegitimate reason then, well, sorry.

Course Organization
While the FLC schedule of classes says we have lecture MWF and lab on W I want to think it's a little different. We will have standard lectures on only M & F and will meet in Theatre 105 (we might look at some plants from time to time in lecture). Wednesdays will represent the time we mostly work with plants and we will meet for the lecture in Berndt 440. Lecture will then blend into lab time and give us more time to work with plants, particularly keying and observing specimens.

Lecture:
Lecture will initially focus on learning the terminology of systematics, how to apply this to keys, the vagaries of nomenclature, and the history and development of different types of classifications. This will provide the background necessary to begin our learning of vascular plant families. We will then focus our lectures on different plant families presented in a phylogenetic order and will include information important to understanding their basic biology, evolutionary relationships, and identification. We will focus on this for a while and then work on other topics important for modern systematics including cladistics, phylogenetics, molecular systematics, and devote some time to examine what constitutes systematic data and how this is used for depicting relationships and delimiting taxa.

Lab:
My main goal for the lab is to drag you kicking and screaming from being a casual observer of plants to being an informed and knowledgeable student of plant biodiversity. ---This might be painful! But in the end you will be happy to have done it. Learning to recognize plant groups is one of the more important skills you will learn in your undergraduate career. Thus most labs will focus on learning how to examine plants and recognize specific plant groups (primarily families), mainly by observing, keying and drawing. We will be learning to recognize by sight approximately 50 different plant families and numerous individual genera.

Specific Requirements
Keying Quizzes: We will have a set of six quizzes in which you use your flora to determine an unknown specimen to species. These quizzes will be held at the beginning of a laboratory period. While I hope that you will all determine the correct species I will award partial credit for the correct family and/or genus determinations. To earn either full or partial credit on a keying quiz you must write out the number of each couplet you take starting with the Key to Families and ending with the specific epithet. If you're not sure what this means now you will very soon.

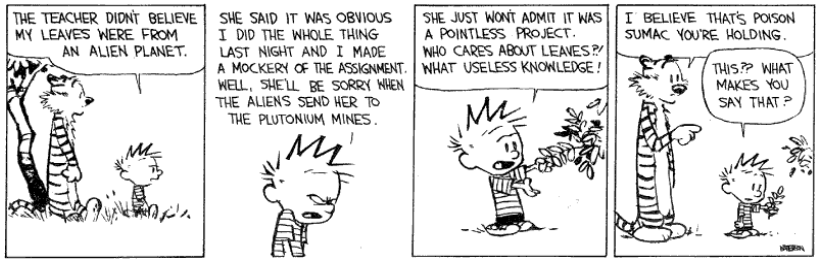
Exams: We will have four exams during the semester. Two of these will be a standard Midterm and Final based principally on the lecture material. These exams will be a mix of multiple choice, short answer, essay and case study type questions. The other two exams will be practical and based on lab material and will require your sight identification of

specimens (either fresh, frozen, or herbarium) to family or genus. You will have access to the lab prior to these practical exams to review material.

Lab Materials: Many of our labs will have worksheets for you to complete which could include drawings, questions, etc. Some of the required questions on your laboratories will come from the text, thus you will be required to have your text for all labs. Our labs on phylogeny will require you to turn in data matrices or completed analyses.

Plant Collection: The plant collection is the single largest independent assignment outside of exams and will be completed in stages during the semester.

Due: October 10, 5 specimens
November 7, 10 new specimens
December 5, Compete Collection of 20 specimens (including all previously submitted specimens)



The plant collection must include 20 identified and labeled specimens representing different species (or infraspecific taxa). All specimens must be labeled with complete collection information (collector's name, collection number, family, genus, species, author citation, collection date, locality, and any additional information regarding ecology or plant form) and corresponding to the format used in the FLC Herbarium (I will provide a Word template to assist you with making your labels). Your specimens will be due at various times during the semester. When specimens are due they should be turned in with each specimen in folded newspaper inside of a large folder (available in the herbarium).

Things to keep in mind

- Your plants must be wild-collected and can come from any geographical location or environment. We have many keying resources available in the lab/herbarium for plant identification from different areas of North America.
- You cannot collect cultivated garden plants - they must be a part of the native flora!
- In making the collection you must remain aware of where you can legally collect and ask permission if necessary.
- You should complete a Plant Collection Worksheet (available on Moodle) for each specimen which will assist you in completing your final specimen label.
- You will be able to sign out a plant press and GPS unit either individually or as a small group to assist with your collecting (and these must be returned or I will not release your final grade for the course!).
- Drying of plants can be performed in the dryer in the herbarium.
- Specimens may be stored in a designated herbarium cabinet during processing and prior to turning in your collection.
- All specimens must include fertile material unless it is not required to make an accurate determination.
- I encourage you to find interesting places to collect – Interesting places = interesting plants. If you know that you are going to the Virgin Islands over Thanksgiving you can wait and collect all at once. I'll even give you a hand with identifying the tropical plant families.
- I also encourage you to start early on this assignment. We all know how soon it can become cold here in Colorado! I suggest collecting many things, even if you have no idea what they are and keying them out later once you know how.
- And lastly I hope that you will see this assignment as FUN and not work.

The collection will be graded in the following manner:

Identification: Specimens will require proper identification. If an identification key other than our Colorado Flora is used for taxon identification, be sure to let me know via a note.

Specimen quality: Full credit will not be awarded to poor specimens.

Label data: Your labels must be complete. All units, including elevation, must be in metric (Hint: – if using a GPS unit just set it for metric units). The only English unit I will accept will be miles (ex. "5 miles West on Forest Rd. 200")
Specific taxa: All your taxa should be Angiosperms (no ferns or Gymnosperms). Your total collection will be required to have at least two specimens from the family Asteraceae and two monocot specimens.

Other assignments: There will be additional assignments, both homework and in-class throughout the term and the specifics of these will be announced later.

Additional Study Resources
There are many web-based tools, Herbarium databases, and image sites available to assist with the learning of Systematic Botany. I will list some of these with links on the course website.

The "golden" rule
There is one all-important rule in this class. Being precise is one of the hallmarks of systematics and taxonomy. Thus precise names are important. Common names are often seen as easier and sufficient for most people – however they are not very precise or used widely in science. If I catch anyone using imprecise common names such as "Butterfly plant" in place of the proper name for a plant (in this case it could mean *Gaura neomexicana* or multiple species in the genus *Asclepias* or *Buddleia davidii* or *Clerodendrum ugandense* or...) – you don't want to know what will happen……

Other Course policies
Academic Integrity:
I expect all students to uphold the highest standards of academic honesty in all exams and assignments. Plagiarism in any form will not be accepted and will at the least result in the loss of credit for the assignment in question and may result in course failure and the filing of a formal report to the proper college authority (Remember, I know how to Google too - so no cut-and-paste from the internet).

Attendance:
While I do not take a daily role, regular attendance is expected – particularly if you want to do well. 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. 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.

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. 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.

Drops:
The college deadline for dropping this class for it not to appear on your transcript is census date, 13 September. Without exceptional circumstances (ie. death in family, hospitalization, etc.) I will not assign a grade of "W" on a drop slip after this date unless you are currently passing the course with a C or better.

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	Reading (Murrell)
Fundamentals of Systematics and Taxonomy			
1	Aug. 29/31 Sept. 2		
	Lecture	• Introduction: What is Systematic Botany? • Plant identification: Botanical key organization	Chap. 1, 5 W&W Intro
	Lab	Innate forms of classification Introduction to flowering plant classification	
2	Sept. 5/7/9		
	Lecture	• Plant morphology I: Variation of vegetative characters • Plant morphology II: Variation of floral and fruit characters **Vegetative Description Homework**	Chap. 3, 11
	Lab	Basic identification of woody plants – Outside on Campus Plant Collection/Documentation Techniques	Chap. 7
3	Sept. 12/14/16		
	Lecture	• Plant morphology II: Variation of floral and fruit characters continued • History of Systematics/ Classification I Prehistory – Linneaus (1753) **Floral Description Homework**	Chap. 3, 6, 11
	Lab	Group keying of flowering plant specimens	
4	Sept. 19/21/23		
	Lecture	• History of Systematics/Classification II Modern Classifications • No Class Friday 23 Sep., Fundraiser for Dr. Ginny Hutchins	Chap. 6
	Lab	Continued group keying practice	
5	Sept. 26/28/30		
	Lecture	• What's in a name: Botanical Nomenclature Format & resources for determining proper names • Naming/describing species **Nomenclature Homework**	Chap. 2
	Lab	**Keying Quiz #1** Herbaria and data information systems Herbarium tour	
6	Oct. 3/5/7		
	Lecture	• Intro to Vascular Plant Phylogeny/Basic Phylogenetic Methods **Lecture Exam I**	Chap. 4
	Lab	Phylogeny Lab I: Morphological Phylogeny of Land Plant Evolution	
Survey of Angiosperm Families			
7	Oct. 10/12/14		
	Lecture	• Basal Angiosperms, Magnoliids, and Basal Eudicots **Plant collection set I due**	Chap. 12
	Lab	**Keying Quiz #2** Basal Angiosperms, Magnoliids, and Basal Eudicots	

8	Oct. 17/19/21		
	Lecture	• Rosids I	Chap. 13
	Lab	**Keying Quiz #3** Rosids: Basal Groups and Rosids I	
9	Oct. 24/26/28		
	Lecture	• Rosids II	Chap. 13
	Lab	**Keying Quiz #4** Rosids II	
10	Oct. 31/Nov. 2/4		
	Lecture	• Asterids: Basal Groups and Caryophyllid Clade **Practical Exam 1**	Chap. 14
	Lab	Asterids: Basal Groups and Caryophyllid Clade	
11	Nov. 7/9/11		
	Lecture	• Euasterids **Plant collection set II due**	Chap. 14
	Lab	**Keying Quiz #5** Euasterids	
12	Nov. 14/16/18		
	Lecture	• Monocots	Chap. 15
	Lab	**Keying Quiz #6** Monocots	
13		**Thanksgiving Break**	
Molecular Systematics			
14	Nov. 28/30 Dec.2		
	Lecture	• Molecular markers and the molecular revolution in systematics and taxonomy **Practical Exam II**	Chap. 16
	Lab	Phylogeny Lab II: *rbc*L Phylogeny of Land Plant Evolution	
15	Dec. 5/7/9		
	Lecture	• Application of molecular systematics to classification, biogeographic puzzles, and evolution **Plant collection set III due**	
	Lab	Identifying the area of origin for an invasive species: a molecular analysis of *Tamarix sp.*	
16	Dec. 12	**Final Lecture Exam 9:45 – 11:45 a.m**	