

BIO 377 - Plant Systematics

Gustavus Adolphus College
Spring 2016

*The rose is a rose,
And was always a rose,
But the theory now goes
That the apple's a rose,
And the pear is, and so's
The plum, I suppose,
The dear only knows
What will next prove a rose,
You, of course, are a rose -
But were always a rose.*

Robert Frost



*To be able to call the plants by name makes them a
hundredfold more sweet and intimate.
Naming things is one of the oldest and simplest of
human pastimes.*

Henry Van Dyke

*To climb these coming crests
one word to you, to you and your children:
stay together learn the flowers
go light*

Gary Snyder

Instructor:

Dr. Cindy Johnson
cindy@gustavus.edu

Office:

Nobel 332, x7043

Office Hours: M,W 11:30-12:30, email for appointments.



Communication

- Email and Moodle will be used to communicate last minute assignments, reminders or other announcements.
- Best to contact me via email with questions or to set up an appointment.

Textbooks and equipment:

Required:

- 10x hand lens
- Field notebook

Recommended:

- Harris, James G. and Melinda Woolf Harris. 2001. Plant Identification Terminology: An Illustrated Glossary. 2nd Ed. Spring Lake Publishers
- Morley, Thomas. 1966. Spring flora of Minnesota. St. Paul, Minnesota: University of Minnesota Press.
- Tree Identification book. (Preston, Richard, and Richard Braham. 2003. North American Trees 5th Edition. Wiley Blackwell Publishers.)
- Plant systematics textbook (Judd, Campbell, Kellogg, Stevens, Donoghue. 2015. Plant Systematics: A Phylogenetic Approach. Sinauer Associates, Inc, Sunderland, MA.)
- Plastic 6" ruler
- Pocketknife (old, for digging in dirt)



Course Description:

The course is designed to give you a broad overview of plant systematics. The lab and lecture are intertwined and include terminology, keys, identification of woody plants, plant families, plant mating systems, speciation, evolution and phytogeography. The course focuses on identification skills using identification manuals. We will cover a lot of material; you will forget much of it. My hope is that you will gain an appreciation for plant diversity and the skills to identify plants.

Course Goals:

- develop familiarity with terminology and skills using technical identification manuals and keys
- identify local flora with emphasis on spring flowering plants and woody plants
- recognize common plant families and distinguish diagnostic characteristics
- explain the key concepts of evolutionary trends in flowering plants including patterns of speciation, biogeography, plant breeding, and pollination
- complete a floristic analysis of local preserve including an analysis and vouchers
- critically examine classification systems and understand the relationships between taxa in the context of proposed changes to biological classification systems
- understand the principles and rules of plant nomenclature including publishing new taxa and proper use of botanical names and authorities
- know how to use an herbarium, herbarium databases and process plant specimens

Disabilities

I am committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need academic accommodation to participate in class, take tests or benefit from the College's services, then you should speak with the Disability Services staff for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services (www.gustavus.edu/advising/disability/) is located in the Academic Support Center. Disability Services Coordinator, Kelly Karstad (Kkarstad@gustavus.edu, x7138) can provide additional information.

Academic Honesty Guidelines

The faculty of Gustavus Adolphus College expects all students to adhere to the highest standards of academic honesty, and to refrain from any action which impinges upon academic freedom of other members of the college community. In all academic exercises, examinations, presentations, speeches, papers, and reports, students shall submit their own work. Students are asked to read the attached honesty policy, sign and return to Dr. Johnson. Full descriptions of the Academic Honesty Policy and the Honor Code can be found in the Academic Catalog (online at www.gustavus.edu/general_catalog/current/acainfo).



Multilingual Students

Support for English learners and multilingual students is available through the Academic Support Center's Multilingual Learner Academic Specialist, Jody Bryant (jbryant2@gustavus.edu or x7197). The MLAS can meet individually with students for tutoring in writing, consulting about academic tasks, and helping students connect with the College's support systems. Students may bring their instructor's documentation concerning their ELL status. For further information, contact the Academic Advising Center.

Bread feeds the body indeed, but the flowers also feed the soul.
The Koran

Life

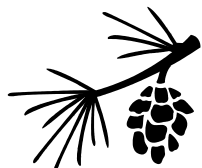
Everyone copes with stress differently. I am happy to help you get the most out of this class. Good planning is your best strategy. Feel free to make an appointment and I will do my best to help. Please know that the Counseling Center is available to assist you at any time and it is strictly confidential.

Grading:

✓ One lecture exam--short answer and essay (100 pts)	100
✓ Dendrogrammaceae (group grade)	20
✓ Nomenclature Assignment	10
✓ Three lab exams (60 pts. each)	180
✓ Family Presentation	25
✓ Family Quiz	20
✓ Flora Project:	80
○ Paper / species list	40
○ Field notes	15
○ Collection vouchers	25
✓ Participation	20
✓ Short assignments	10
Total	465



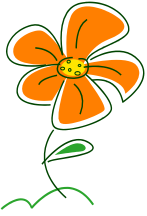
*The Earth Laughs in
Flowers*
Ralph Waldo Emerson



- Papers, reports, and exams submitted or taken late will be worth 10% less each day delayed (including weekends).
- Lab exams include sight identification, terminology and keying skills (identifying unknowns).
- Students are encouraged to collaborate on course tasks; however each student must submit an independent piece of work.
- Assignments must be submitted on moodle unless otherwise noted.
- Lectures and reading assignments will be posted on Moodle.

Class Participation / Attendance

- Participation in discussions, field trips and projects is essential. Degree of participation (engagement in discussion, preparation, questions, etc.) will determine the participation grade. Though the readings and class materials, you should be able to formulate your own thoughts on the topics discussed and verbally defend your ideas. Be prepared to express your thoughts, listen to others and debate the issues. Simply attending class will not earn you participation points, you must engage!
- Participation includes: helping gathering and transporting equipment and vehicles, maintaining the lab (collections are organized, treated respectfully and returned to their proper storage location)
- I will not track your attendance in class. However participation is essential and poor attendance will be reflected in the participation grade. If you need to miss class, please inform me in advance of your absence.



Field Expectations

- Students should prepare to be outside during lab regardless of the conditions. (Rain, snow will not keep us indoors.) You should wear the appropriate clothing depending on the activity (raincoat, long pants, hiking shoes, hat, etc.). You may also want to carry water and insect repellent. Wearing the proper clothing will help you enjoy the labs. If you are allergic to bee or wasp stings please inform me and carry the appropriate medical supplies should you be stung.

Dendrogrammaceae (20 pts)

Purpose: Practice terminology, classification, phylogeny

- This is an artificial family. You will work in groups of 4 and design your cladogram.

Requirements:

1. Cladogram presented in large format drawing allowing comparison among different groups. Consult book or websites to help you draw your cladogram.
2. Written rationale including:
 - a. Your final data table showing presence/absence of characters.
 - b. Correct use of terminology.
 - c. Accurate evolutionary trends.
3. Questions to consider:
 - a. Which taxa did you choose as your outgroup?
 - b. What are the traits of the hypothetical ancestor? Include a drawing of this ancestor.
 - c. Are you confident that your cladogram reflects the true evolutionary relationships of the Dendrogrammaceae? Why or Why not?
 - d. Were there any ambiguities or contradictions in your cladogram? If so, what were they? What kinds of data would you need to resolve the true relationships?
 - e. How did the selection of traits affect the results of your cladistic analysis? How might your cladogram have turned out differently if you had chosen different traits?
 - f. Which taxa are monophyletic, paraphyletic, polyphyletic and why?
 - g. Are you able to support all the branches? For example, if you have three species and you can't tell which two of them are more closely related, the most "honest" thing to do is to draw all three of them coming from a single node.



Grading (group grade = 20 pts):

- Cladogram drawing includes all species in the Dendrogrammaceae. (4 pts)
- Shared ancestral and derived characteristics clear and unambiguous. (4 pts)
- Data table based on "real" differences. Terminology correctly used. (4 pts)
- Rationale is accurate, logical and based on evolutionary trends. (4 pts)
- Assumptions justified by providing plausible speculations on environmental "pressures" (natural selection). Include hypothetical ancestor. (4 pts)

Family Presentation (25 pts)

Purpose: Gain familiarity with plant families and literature.

Requirements: 15-minute oral Power Point presentation on family of choice. Points will be awarded for completeness, creativity and effectiveness.

Grading:

Systematics Content (15 points)

Submit notes and/or powerpoint handout following presentation

Accuracy

Pertinent diagnostic features highlighted

Presentation / Creativity (10 points)

Was the material effectively delivered?

What did we learn?

Were additional materials used effectively? (Internet, live plants, etc...)



When you have only two pennies left in the world, buy a loaf of bread with one, and a lily with the other.
–Chinese Proverb

Flora Project (80 pts)

There will be an optional 5-day fieldtrip to the Ozarks in Missouri. Missouri is a significantly different flora than Minnesota and will give students and opportunity to experience the flora, practice keying skills and family identification skills. Students are required to choose between the St. Peter flora project and the Missouri flora project. The cost for the fieldtrip will be determine on the number of students participating.

Purpose: Document the spring flora of the Ozarks in Missouri; learn to collect and prepare herbarium collections.

Requirements:

- a. One set of vouchers (minimum 25 specimens), correctly identified and mounted.
- b. Complete field notes.
- c. Report which includes discussion on the following topics:
 - Number and summary of species, genera and families.
 - Comparison of number of species with other similar areas.
 - Occurrence – (frequency) and general habitat all species.
 - Notes on phenology
 - Origin of species (introduced or native).
 - Origin of flora (land history, phytogeography).
 - Complete list of species including authorities and common names.
 - List of all literature cited.
- d. The report should be modeled after examples shown in class.
- e. Students are encouraged to collect and identify plants cooperatively, but each student must submit their own independent report and set of vouchers.



If you've never been thrilled to the very edges of your soul by a flower in spring bloom, maybe your soul has never been in bloom.
~Audra Foveo

Grading:







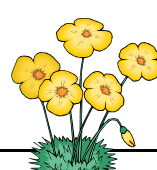
- Paper (40 points)
 - Introduction (5 pts): goals of project, general location, general description of site (geography, geology, land use)
 - Methods (5 pts): dates, specific locations, references used
 - Vegetation Analysis (10 pts): brief flora description of sites visited, taxa summary, flora summary
 - References (5 pts.): complete, properly cited
 - Species List (15 pts.): taxonomy correct, authorities, abundances, common names, list is representative of area
- Field Notebook (15 points): complete / accurate, done in field, habitat notes are complete, reasonably easy to read and organized, adequate space, numbering system is logical, easy to decipher
- Vouchers (25 points):
 - Identification: incorrect, not enough material to positively identify from voucher
 - Specimen: flower / fruit missing, root missing / dirty, need more specimens or larger sample poor quality specimen
 - Technique: labels, mounting - loose or incompletely strapped, arrangement, too much glue, pressing - leaves folded, flowers not exposed, fragment packet

It is not so much for its beauty that the forest makes a claim upon men's hearts, as for that subtle something, that quality of air that emanation from old trees, that so wonderfully changes and renews a weary spirit.
~Robert Louis Stevenson










I frequently tramped eight or ten miles through the deepest snow to keep an appointment with a beech-tree, or a yellow birch, or an old acquaintance among the pines.
~Henry David Thoreau

Plant Systematics Tentative Schedule 2016

Date			Topic	Graded Assignments (readings posted on Moodle)	
February	M	8	Introduction		
	W	10	Natural variation: linking genotype & environment		
	W	10	Lab: Twig morphology		
	F	12	Nomenclature		
	M	15	Nomenclature / Anthophyta		
	W	17	Anthophyta / Flower morphology		
	W	17	Lab: Vegetative morphology		
	F	19	Flowers - carpel development		
	M	22	Inflorescences	NOMENCLATURE 	
	W	24	Fruits		
	W	24	Lab: Flowers, Fruits, Inflorescences		
	F	26	Asteraceae		
March	M	29	Phylogenetic Trends -- Dendrogrammaceae	 DENDROGRAMACEAE	
	W	2	Dendrogrammaceae Show Down		LAB EXAM
	W	2	LAB EXAM 1 - Twig keying		LAB EXAM
	F	4	LAB EXAM 1 - Morphology		LAB EXAM
	M	7	Pteridophytes		
	W	9	Flora formula / Diagrams		
	W	9	Lab: Pteridophytes		
	F	11	Phylogeny : paleoherbs, magnolids, & eudicots		
	M	14	Gymnosperms	 PRESENTATION	
	W	16	Phylogeny : paleoherbs, magnolids, & eudicots		
	W	16	Lab: Gymnosperms		
	F	18	FAMILY PRESENTATIONS		
	M	21	FAMILY PRESENTATIONS	 PRESENTATION	
	W	23	FAMILY PRESENTATIONS		PRESENTATION
	W	23	Lab: Woody Anthophyta		PRESENTATION
	F	25	Classification		
Spring break					

Spring Break (After spring break we may utilize lecture periods for campus field trips.)

Date			Topic	Graded Assignments (readings posted on Moodle)	
April	M	4	Breeding Systems		
	W	6	Breeding Systems		
	W	6	Lab: Woody Anthophyta		
	F	8	Pollination		
	M	11	Pollination		
	W	13	Pollination		
	W	13	LAB EXAM 2 – Pteridophytes, Coniferophyta, Anthophyta -- keying	LAB EXAM	
	F	15	LAB EXAM 2 – Pteridophytes, Coniferophyta, Anthophyta -- identification	LAB EXAM	
	M	18	Herbarium Techniques		
	W	20	Phytogeography		
	W	20	Lab: Families / Keying	FAMILY QUIZ	
	F	25	Phytogeography		
	M	25	Missouri Geology / Ecology		
	W	27	Missouri Ozarks 10:00 departure		
	T	28	Missouri Ozarks		
	F	29	Missouri Ozarks		
	S	30	Missouri Ozarks		
May	S	1	Missouri Ozarks: return ~ 8 pm		
	M	2	No class		
	W	4	No class		
	W	4	Lab: Project Consultation		
	F	6	New Species / Revisions / Monographs / Keys		
	M	9	Family / keying		
	W	11	Family / keying		
	W	11	Lab: Families		
	F	13	Family / keying	FLORA DUE	
	M	16	Plant Conservation		
	W	18	Evaluation / Review		
	W	18	FINAL LAB EXAM	FINAL EXAM	
	F	20	FINAL LECTURE EXAM (1-3 pm)	FINAL EXAM	

Academic Honesty and Honor Code Plant Systematics– Bio 377 Dr. C. Johnson

As a Gustavus Adolphus College student you were required to sign the following statement before final admittance into the College and/or registration for fall courses:

As a community of scholars, the faculty and students of Gustavus Adolphus College have formulated an academic honesty policy and honor code system, which is printed in the Academic Bulletin and in the Gustavus Guide. As a student at Gustavus Adolphus College, I agree to uphold the honor code. This means that I will abide by the academic honesty policy, and abide by decisions of the joint student/faculty Honor Board.

In keeping the honor code, I ask you to read this document and sign below. Your signature below indicates that you understand this pledge. This statement must be signed and dated before I will grade any of your assignments. This pledge applies to ALL the assignments in Plant Systematics (tests, papers, other assignments and therefore I will not ask you to sign for each test or assignment. Your signature here confers agreement that you pledge academic honesty on ALL Plant Systematics assignments.

I have read and understand the Academic Honesty Policy for Plant Systematics. On my honor, I pledge that I will not give, receive, nor tolerate others' use of unauthorized aid in completing any of my assignments for Plant Systematics (Bio 377).

All assignments are independent works and reflect your effort. Only when expressly announced in class do I encourage you to work with others to collect, discuss and summarize data. In this case summary of the raw data collected in lab is an acceptable group activity including discussions of what the data means. However, each student is expected to independently formulate conclusions based on the summarized data. For example, though students may discuss the data collected by the class, each individual must summarize their own conclusions based on the data. To reiterate:

- Summarizing data may be an analytical / mathematical group activity if expressly approved in class.
- Interpretation of the data should reflect independent thought, unless exceptions are made in class for group analysis.
- Drawing conclusions from the analysis is an independent activity and should reflect your ideas, arguments and analysis.

Presenting work, even group work, as your own constitutes plagiarism. Academic honesty includes plagiarism. Plagiarism of peers, Internet sources, library sources or other sources will not be tolerated. Students are expected to credit sources and properly cite information on all papers. If you are uncertain about what constitutes plagiarism, speak to me or visit any of the following websites: <http://sja.ucdavis.edu/avoid.htm>, <http://www.indiana.edu/%7Ewts/wts/plagiarism.html>, http://owl.english.purdue.edu/handouts/research/r_plagiar.html.

An integral part of the honor code is non-tolerance of violations. Under the Gustavus Academic Honesty Code, students are not expected to police others' actions. However, you have agreed to report violations of which you become aware. Failure to do so will constitute an honor code violation in this class.

Any student found in violation of the academic honesty policy and honor code will receive a grade of 0 for that particular exam, activity, or paper. In addition, the office of the Dean of the Faculty will be notified. A second violation will result in an F for the course. Please see either Dr. Johnson if you have any questions about these policies.

Sign, detach and submit to Dr. Johnson

Plant Systematics (Bio 377) – Academic Honor Compliance – Spring 2016

I have read and understand the Academic Honesty Policy for Plant Systematics (Bio 377). On my honor, I pledge that I will not give, receive, nor tolerate others' use of unauthorized aid in completing any of my assignments for Plant Systematics (Bio 377).

Print Name _____

Student ID # _____

Signature _____

Date _____