

# Plant Diversity (Biology 348)

Fall 2021

(Lecture: MWF 8:30-9:20 am, ISC 137; Lab: R 2:00 – 4:50 pm, ISC 206)

## Course overview

Plants are ubiquitous in our environment and vital to our survival, yet their diversity and elegant design often go unappreciated, even by many biologists. This course provides an overview of the remarkable biology and variety of inanimate forms of life including archaea, bacteria, protists, fungi, and algae, with an emphasis on the nonvascular and vascular plants. We will explore the characteristics that unite and distinguish these organisms. The course will span levels of organization from the cell to tissues and organs and the whole organism, and explore aspects of metabolism, physiology, ecology, and evolution. We will consider how plants grow, reproduce, and respond and adjust to their environments. Plants play key roles in ecosystems, not only because they are foundations of food webs and providers of habitat, but also because they interact with so many other organisms. And of course, humans benefit greatly from the products of these primary producers like fiber, wood, medicine, and food, and the ecosystem services they provide through nutrient cycling, the water cycle, and contributing oxygen to our atmosphere.

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Office hours: Online, T 1-2 pm (by appt), F 11-12 pm; in-person (ISC 206), W 9:30-10:30 am

Course description from Bulletin: This course covers bacteria, algae, fungi, and both vascular and nonvascular plants. The structure, function, ecology, and economic importance of these groups will be introduced both in lecture and in lab. (4 credits; 3 hrs lecture/3 hrs lab)

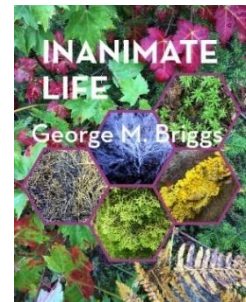
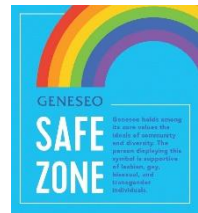
Prerequisites: Biol 117 and Biol 119

Course website: [canvas.geneseo.edu](https://canvas.geneseo.edu)

What you will need: Internet access and laptop computer.

Required textbook: *Inanimate Life* by George M. Briggs. Milne Open Textbooks. Available as an ebook or download the pdf here:

<https://milnepublishing.geneseo.edu/botany/>



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## Learning outcomes

Successful students in this course will be able to

- recognize the major forms of inanimate life and the characteristics that distinguish them, be able to identify a set of key organisms, and to document plant diversity through field observations
- identify examples of how form and structure contribute to function
- describe patterns in asexual and sexual reproduction in fungi, algae, non-vascular, and vascular plants
- explain how plants obtain and use matter and energy to grow
- identify plant adaptations related to interactions with other organisms and ecological significance of such interactions
- explain how plants provide key resources and ecosystem services valuable for humans
- effectively communicate through written and oral forms the context, interpretation, and significance of research findings, and apply information from primary literature

## How this course will run

### Overview of course activities

The lecture portion of the course will introduce you to many aspects of the biology of plants and other forms of inanimate life: classification and evolutionary history, anatomy, structure and function, physiology, development and growth, reproduction, and ecology. We will also address the importance of plants to human well-being. In the course laboratory, through both lab activities and field trips, you will gain experience in identifying different forms of inanimate life and the characteristics that distinguish them. You will learn to identify aspects of their anatomy and how they relate to their function. We will also conduct several multi-week studies to address particular questions in plant biology. Some lab activities will involve data interpretation and analysis.

In order to maximize hands-on learning and to carry out tasks that are important to some of the experiments we will perform, I will be using some of our “lecture” periods during the MWF 8:30-9:20 am time slot for more “lab” oriented activities. Make sure to pay attention to class/Canvas announcements that may indicate to meet in our lab room instead of the classroom on particular days.

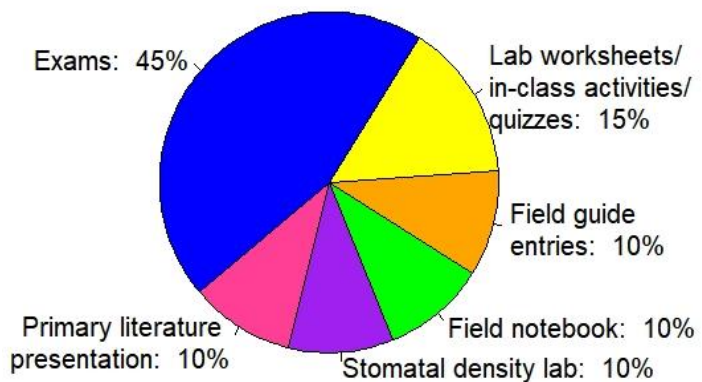
### Attendance expectations and public health

In the context of the COVID-19 pandemic, it is vital that we all do what we can to protect the health and safety of each other. If you are experiencing symptoms associated with COVID on a day that class meets in-person, do not attend. Remember that it is better to stay home if you are not feeling well than to attend class and risk spreading illness to others. I will also follow this advice, so if I do not feel well, I may run a class through Zoom or post a recorded lecture instead of holding class in-person. Throughout the semester, please be proactive in communicating about absences and contact the Dean of Students if you expect to be out for an extended period of time. Rest assured that there will be no penalty for missing class and that I've designed our course so that there's a path for you to make up any learning that takes place in a class meeting you miss.

### How is your grade determined?

#### Exams (45% of grade)

You will be assessed on your knowledge of material presented in lab and lecture through several exams delivered during our lecture period. There will be four exams: the first three will each be worth 10% of your grade, and the final exam will be worth 15% as it will also include a lab practical component. Except for the lab practical component, the final exam will not be cumulative. Throughout the semester, study questions will be posted in a Google Doc to help guide your review.



#### Lab worksheets, in-class activities, and quizzes (15% of grade)

Some labs will involve completing worksheets or some other small final product. We will have some in-class activities during lecture periods for which you will turn in work. You will have weekly online quizzes to help you keep up with the course reading.

### Field guide entries (10% of grade)

You will be contributing to an online field guide of native plants in the Arboretum gardens through writing short descriptions of the morphology, distribution, ecology, and historical uses of several species and finding appropriate photos to show their features.

### Field notebook and iNaturalist observations (10% of grade)

You will be expected to take field notes and make sketches of key organisms during field trips. You will also pick a site on or near campus or a favorite local destination to revisit several times over the first two months of the course. (This site must have plants growing wild; it should not be a cultivated garden or landscaped area.) You will make observations of the local flora there and note how it changes as the season progresses. To aid in identification of plants in your site you will submit photographic observations to the online community science app iNaturalist.

### Stomatal density lab report (10% of grade)

In the stomatal density lab project, you will be responsible for coming up with a question and hypothesis to test, designing your sampling strategy, and collecting and analyzing your data. You will give a short presentation in lab on your results from your stomatal density lab, and then prepare a full written report in the style of a typical scientific paper.

### Primary literature paper presentation (10% of grade)

You will be sharing a primary literature paper on a topic in plant biology of your choice through a short oral presentation during one of our lab periods. The paper must come from a list of pre-selected journals and be approved by the instructor.

### COVID-19 contingencies

We must be flexible in this course as public health considerations might force us to make changes to how this course runs over the course of the semester. If restrictions on face-to-face interactions interfere with course activities, some of the assignments described above may be altered or replaced, the means of content delivery may change, and the course schedule may require revision. If this is the case, be assured that my priorities are student success, course continuity, and accessibility of information.

### Grading scale

A	93-100%	B	83-86.9%	C	73-76.9%
A-	90-92.9%	B-	80-82.9%	C-	70-72.9%
B+	87-89.9%	C+	77-79.9%	D	60-69.9%

I follow conventional rounding procedures, so a 92.94% would represent an A- (rounded down to 92.9%), while a 92.95% would be rounded up to 93.0% and an A.

### How to be successful in this course

#### Health and well-being in a stressful time: take care of yourself

The changes brought on by COVID-19 have impacted us all in a number of ways and will continue to do so at various times and to varying degrees during the upcoming semester. Your health and well-being are foundational to your ability to learn, and if you find that you are feeling unwell (physically or mentally) and it is impacting your ability to complete your coursework, please reach out. Concerns about academic

performance, health situations, family health and wellness (including the loss of a loved one), interpersonal relationships and commitments, and other factors can contribute to stress. Students are strongly encouraged to communicate their needs to faculty and staff and seek support if they are experiencing unmanageable stress or are having difficulties with daily functioning. The [Dean of Students](#) (585-245-5706, [www.geneseo.edu/dean\\_students](http://www.geneseo.edu/dean_students)) can assist and provide direction to appropriate campus resources. The college also has collected resources in a [Coping with College webpage](#).

### Take advantage of course resources and study aids

I continually update a Google doc with study questions that you can use to help guide your review of course material (available in a Google drive folder; make your own copy of to create a version you can edit). PDFs of the lecture slides are also posted in a Google drive folder.

### Come see me if you need help!

*Office hours.* Some of my office hours will be **online** this semester and conducted via Zoom video conference. I will have regular “walk-in” office hours which are first-come, first-served. You may have to wait in the Zoom “waiting room” until I finish with other students. I will also have scheduled 15-min office hour sessions that you can sign up for via my Google Calendar. See Canvas for details. If any of the posted times do not suit you, you can email me to set up another appointment for a video conference. When doing so, please suggest some possible times that you are available to meet in your email to make our correspondence more efficient. I will also hold some in-person office hours at a set time in our lab room, ISC 206. Generally, I will not meet with students for office hours in my office.

*Email communication.* I can often answer your questions by email as well. Please do not expect an immediate response – I will try to get back to you within 24 hours.

### Back up your work

Do yourself a favor to avoid last-minute computer calamities and stress by saving your work frequently and backing up your files using some kind of cloud storage system like Google Drive, OneDrive, Dropbox, or some other service. CIT provides some [tips on data backup](#). Also, don’t wait until the day before a deadline to get started!

### Diversity and inclusion

The Department of Biology has pledged to develop more inclusive pedagogical practices and work to promote diversity in our curriculum while confronting racism, particularly ways in which science has been used to sustain it ([Biology Department’s Statement in Support of Racial Justice](#), also available on [Department of Biology website](#)). This course is no exception, and to help achieve these goals I will be highlighting the work of scientists of diverse identities and backgrounds in the field of plant biology. I hope to create an inclusive and supporting learning environment in which anyone can succeed, regardless of your identity (race, gender, ethnicity, sexual orientation, age, socioeconomic status, religion, and ability). I want to provide for students’ growth as scientists and learners and promote a sense of belonging.

### Land acknowledgment

The SUNY Geneseo campus is located in the historic homelands of the Seneca Nation of Indians and Tonawanda Seneca Nation. As stated in the [Community Commitment to Diversity, Equity, and Inclusion](#), “we at SUNY Geneseo have an obligation to recognize all who, through history or identity, have been marginalized or oppressed, made invisible or silenced.” I encourage you to keep in mind the original

occupants of the field sites we explore in this course. We will consider traditional ecological knowledge in relation to some topics in plant biology, and you will also investigate the roles of local native plant species in Native American culture.

### **Lab and field work and safety**

#### **Face masks**

According to [current campus policy](#), face masks are required in all instructional spaces (including classrooms, lecture halls, and laboratories) and all common areas including residence halls and academic buildings. If you forget your mask, please be sure to pick up a disposable one before entering the classroom. Masks must be worn for the duration of lecture and lab sessions and must cover both your mouth and your nose. Masks must also be worn the entire time that we are in a van for a field trip. If you do not have a mask or are unwilling to wear one, you will be asked to leave the classroom. I cannot safely hold class if all students are not wearing face masks. If my teaching could be more accessible if I wear a clear face mask, please let me know as soon as possible. Students who have concerns about wearing a face mask due to a documented disability need to contact the Office of Accessibility Services ([access@geneseo.edu](mailto:access@geneseo.edu)) to request reasonable accommodations.

#### **Lab preparation**

If we are doing a field-based activity, you should be dressed for the weather with appropriate outerwear and shoes that can get muddy or wet – it is your responsibility to check the weather conditions and use your judgment about what to wear. Sometimes plans for a lab session may change at the last minute because of the weather; you should make sure to check your email on the day of a lab to find out any changes. Please be courteous to the instructor and your classmates by arriving on time, particularly on field trip days. Pay attention to announcements on Canvas that may ask you to bring your laptop for the day's activities.

#### **Lab and field safety**

Your safety and comfort are important to me. Please be prepared for our field trips by dressing appropriately for the weather and terrain, bringing water, and carrying any medication you might need (allergy medication, inhaler for asthma, epipen, etc.). Inform me of any allergies (particularly to bee stings!) or other medical conditions that could require emergency treatment. Also be prepared by applying sunscreen when appropriate or wearing clothing to protect yourself from the sun. We could encounter mosquitoes, ticks, other biting/stinging insects, and poison ivy on our outings, so be aware of these risks, and feel free to ask me any questions about them. While we are traveling to a field site in a vehicle you should be wearing a face mask. Also, be mindful of your safety if you go to a field site on your own outside of our regular lab sessions. It is a good idea to bring a friend with you, or at least to tell someone where you are going and when you expect to be back.

No food or drink containers are permitted in the lab, either during or outside regular lab times. You should not be eating or drinking in the lab and should always have your mask on in the lab, even if alone, because it is a shared space.

### **Other course policies**

#### **Late work**

Online quizzes on the reading should be completed by the indicated due date to help you keep up with course content. Once closed on Canvas the quizzes will not be opened up again unless there are

extenuated circumstances. Your lowest quiz grade will be dropped. Graded assignments will be penalized by a loss of 5% of the total assignment's points possible per day. But if you think you must turn in something late because of extenuating circumstances, feel free to discuss the situation with me and we can negotiate terms.

### Plagiarism and academic dishonesty

Plagiarism and other forms of academic dishonesty (cheating, turning in another student's work as your own) will not be tolerated. Evidence of academic dishonesty is grounds for a score of zero on any assignment and further action including notifying the department chair, Dean of Academic Planning and Advising, Dean of Students, and Student Conduct Board, which can result a report filed with the Dean of Students.

Plagiarism. According to the Academic Dishonesty Policy in the Student Handbook (<https://www.geneseo.edu/handbook/academic-dishonesty-policy>), plagiarism includes the following:

1. direct quotation without identifying punctuation and citation of source;
2. paraphrase of expression or thought without proper attribution;
3. unacknowledged dependence upon a source in plan, organization, or argument.

In SUNY Geneseo's policy, "Plagiarism is the representation of someone else's words or ideas as one's own or the arrangement of someone else's material(s) as one's own." Take care to properly cite sources of ideas, figures, data, etc. (including internet sources) in your writing and presentations. Even if you properly cite your source, when you borrow wording and sentence structure from the original source and pass it off as your own (i.e., by not using quotation marks), you are guilty of plagiarism. Learn how to paraphrase in your own words information from the original source.

### Copyright statement

Many of the materials that are provided to students in this course have been created by me. Students would be best to assume that all course materials are protected by legal copyright. Copyright will be indicated by a "© DATE AUTHOR" on the document. Copyright protection means that reproduction of this material is prohibited without the author's consent. Thus, students are prohibited sharing or posting copyrighted material to any websites outside our course Canvas site. Students are also prohibited from reproducing material to be shared with other more limited groups (e.g., sorority/fraternity test bank).

### Student success resources

Accessibility and accommodations. SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility will coordinate reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities to ensure equal access to academic programs, activities, and services at Geneseo. Students with letters of accommodation should submit a letter to each faculty member and discuss their needs at the beginning of each semester. Please contact the Office of Accessibility Services for questions related to access and accommodations: [access@geneseo.edu](mailto:access@geneseo.edu), 585-245-5112, [www.geneseo.edu/accessibility-office](http://www.geneseo.edu/accessibility-office).

Reporting bias-related incidents. Here at SUNY Geneseo, we want to provide a space where everyone feels welcome to learn and grow in their identities as well as in their role as students, faculty, and staff. If in the unfortunate instance you experience an incident of bias, we encourage you to reach out to the we encourage you to reach out to the Chief Diversity Officer ([routenberg@geneseo.edu](mailto:routenberg@geneseo.edu)), Director of Multicultural Programs and Services ([seloievans@geneseo.edu](mailto:seloievans@geneseo.edu)), and/or our University Police Department. In trying to create an environment that facilitates growth through diverse thoughts and ideas, reporting incidents of bias - including threats, vandalism, and microaggressive behaviors - can help bring

a better understanding of our campus climate as well as provide opportunities for learning and restoring harm.

**Student well-being and mental health.** Prioritizing well-being can support the achievement of academic goals and alleviate stress. Eating nutritious foods, getting enough sleep, exercising, avoiding drugs and alcohol, maintaining healthy relationships, and building in time to relax all help promote a healthy lifestyle and general well-being.

As a student, you may experience a range of challenges that can impact your mental health and thus impact your learning; common examples include increased anxiety, shifts in mood, strained relationships, difficulties related to substance use, trouble concentrating, and lack of motivation, among many others. These experiences may reduce your ability to participate fully in daily activities and affect your academic performance.

SUNY Geneseo offers free, confidential counseling for students at the Lauderdale Center for Student Health and Counseling, and seeking support for your mental health can be key to your success at college. You can learn more about the various mental health services available on campus at [health.geneseo.edu](http://health.geneseo.edu). To request a counseling appointment, please complete the online form through [myhealth.geneseo.edu](http://myhealth.geneseo.edu). Getting help is a smart and courageous thing to do -- for yourself and for those who care about you.

**Other resources.** Additional resources are available to support your academic success and well-being, including [academic support services](#), [library research help](#), [computer and technology support](#), food security support, and emergency funding. See the “Student Success Resources” link on the Canvas course page for more information about these services.

**Dates of major assignments and exams** (excludes lab worksheets, in-class activities, online quizzes)  
(Note: may require modification if public health situation requires changes in course structure)

Assignment	Deadline	Details
Field guide entries – plant choices due	W, Sept 8	Put preferences on Google sheet
Field guide entries due	R, Sept 23	Final version
Exam I	M, Sept 27	
Field notebook & iNaturalist observations due	W, Oct 27	May have periodic notebook checks before deadline
Exam II	F, Oct 22	
Stomata lab presentation & data analysis due	R, Oct 28	Present in class, submit data files/R code
Primary literature paper choice due	M, Nov 1	
Stomatal density lab draft due	Sa, Nov 6	Submit any revised R code with draft
Exam III	W, Nov 17	
Stomatal density lab due	M, Nov 22	Submit any revised R code with final
Primary literature presentations in lab	Nov 18, Dec 2, Dec 9	Schedule meeting with instructor and complete worksheet on paper a week before presentation
Final exam, 8 – 11:20 am	M, Dec 20	includes lab practical in ISC 206

## Course Schedule

*This is a tentative course schedule that is subject to change. Refer to Canvas for an updated schedule of lecture topics, lab activities, readings, and assignments week by week. Exam dates will remain fixed unless changes are necessitated by changes in the public health situation.*

Week	Day	Date	Topic/activity	Reading/Assignments due*
<b>Unit 1</b>	<b>1</b>		<b>Structure &amp; reproduction</b>	
1	M	8-30	Overview of course; what is an organism?	1-Organisms; 2-Taxonomy & Phylogeny
1	W	9-1	Boundaries: cell walls & other structures	3-Boundaries
1	R	9-2	<b>LAB: Arboretum exploration</b>	
1	F	9-3	Cellular structure of inanimate life forms	4-Organism form: composition, size, shape
2	M	9-6	<b>NO CLASS – Labor Day</b>	
2	W	9-8	Organs, tissues, and cellular structure	5 – Cellular structure in inanimate life; 6-Organ, tissue, and cellular structure; <b>field guide preferences due</b>
2	R	9-9	<b>LAB: Stony Brook OR greenhouse lab</b>	<i>half of class goes on field trip/half of class does self-guided lab</i>
2	F	9-10	Lab activity: count trichomes	<i>Meet in ISC 206</i>
3	M	9-13	What are algae? activity	
3	W	9-15	Reproduction: unicellular organisms, algae	11-Reproduction & sex
3	R	9-16	<b>LAB: Stony Brook OR greenhouse lab</b>	<i>half of class goes on field trip/half of class does self-guided lab</i>
3	F	9-17	Fungal reproduction	12-Fungal sex and fungal groups
4	M	9-20	Non-seed plant reproduction	13-Sex and reproduction in non-seed plants
4	W	9-22	Seed plants	14-The development of seeds
4	R	9-23	<b>LAB: Mendon Ponds/grocery store botany</b>	<i>half of class goes on field trip/half of class does self-guided lab; field guide entries due</i>
4	F	9-24	Reproduction: gymnosperms & angiosperms	15-Sex and reproduction in seed plants
5	M	9-27	<b>EXAM I</b>	



Week	Day	Date	Topic/activity	Reading/Assignments due*
<b>Unit 2</b>			<b>Metabolism &amp; development</b>	
5	W	9-29	Flower structure & reproduction	
5	R	9-30	<b>LAB: Mendon Ponds/grocery store botany</b>	<i>half of class goes on field trip/half of class does self-guided lab</i>
5	F	10-1	Control and patterns of reproduction	16-Reproduction: development & physiology
6	M	10-4	Leaves and leaf anatomy	8-Vascular plant anatomy: primary growth
6	W	10-6	Matter & energy; cellular respiration	18-Matter, energy, and organisms; 19-Cellular respiration
6	R	10-7	<b>LAB: Cells &amp; tissues</b>	Also count trichomes
6	F	10-8	Photosynthesis	20-Photosynthesis
7	M	10-11	<b>NO CLASS – Fall Break</b>	
7	W	10-13	Leaf design activity	24-Material movement and diffusion's multiple roles in plant biology
7	R	10-14	<b>LAB: Stomatal density part 1</b>	<i>Harvest and plant seeds</i>
7	F	10-15	Photosynthetic pathways, metabolic diversity	21-Metabolic diversity
8	M	10-18	Plant development	7-Producing form, development
8	W	10-20	Plant form	10-Vascular plant form
8	R	10-21	<b>LAB: Stomatal density part 2</b>	
8	F	10-22	<b>EXAM II</b>	
<b>Unit 3</b>			<b>Growth &amp; resource acquisition</b>	
9	M	10-25	Primary vs. secondary growth	8-Vascular plant anatomy: primary growth; 9-Secondary growth
9	W	10-27	Wood activity	<b>field notebook &amp; iNaturalist observations due</b>
9	R	10-28	<b>LAB: Count trichomes, stomata lab presentations, sow C-fern spores</b>	<b>Stomatal density lab presentation &amp; data analysis due</b>
9	F	10-29	Dendrochronology	
10	M	11-1	Long-distance transport	24-Material movement and diffusion's multiple roles in plant biology; <b>primary literature paper choice due</b>
10	W	11-3	Alternation of generations	

Week	Day	Date	Topic/activity	Reading/Assignments due*
10	R	11-4	<b>LAB: C-fern gametophyte &amp; fertilization; artificial selection lab analysis</b>	
10	F	11-5	Plant nutrition	22-Nutrition and nutrients; <b>stomatal density lab report draft due Sat 11-6</b>
11	M	11-8	Plants and soil	23-Soils
11	W	11-10	Long-distance transport	
11	R	11-11	<b>LAB: C-fern sporophyte; soils</b>	
11	F	11-12	Plant growth	25-Plant growth: patterns, limitations, and models
12	M	11-15	Plants and temperature	26-Interactions involving conditions
12	W	11-17	<b>EXAM III</b>	
<b>Unit</b>	<b>4</b>		<b>Interactions &amp; services</b>	
12	R	11-18	<b>LAB: Digital herbarium</b>	
12	F	11-19	Mutualisms involving nutrients	27-Biotic interactions
13	M	11-22	Pollination biology	<b>Stomatal density lab report due</b>
13	W-F	11-24 – 11-26	<b>NO CLASS – Thanksgiving Break</b>	
14	M	11-29	Reproduction isolation in columbines	17-Sex, evolution, and the biological species concept
14	W	12-1	Herbivory and plant defense	
14	R	12-2	<b>LAB: Winter botany</b>	
14	F	12-3	Plants and people - medicines	
15	M	12-6	Plants and people – agriculture	28-Agriculture; 31-Propagating plants & developing new plants
15	W	12-8	Plants and people – invasive species	29-Weeds and weed control
15	R	12-9	<b>LAB: Plants and climate change</b>	
15	F	12-10	Pests and weeds	30-Threats to agriculture: insects and weeds
16	M	12-13	Plants and human culture	
	M	12-20	<b>FINAL EXAM: 8 – 11:20 am</b>	in ISC 206; includes lab practical