

# Augustana College

## BIOL324. Techniques in Natural History. 4 credits. Fall 2019

### Class time and location

MWF 9:55am to 11:10am

Hanson 322

### Instructor

Dr. Rafael Medina

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Office hours: by appointment at your request via email or in person.

Email policy: Under ordinary circumstances, I reply all emails within a 24h period (Monday to Friday, 8am to 6pm). Use BIOL324 in the subject.

### Course description and goals

This course is an introduction to natural history collections in the 21<sup>st</sup> century (purpose, use, and operation). You will learn how specimens are collected, vouchered, genotyped, and digitized, and as a class we will wonder about their role as a tool for the advancement of science and society, including ethical aspects. You will be working with actual specimens either prepared by you or from our collection in the AUGIE herbarium. Although we will use primarily plants, invertebrates, and slime molds as models, the goals of this course can be extrapolated to any kind of collection of voucher organisms (birds, fossils, microorganisms,...). This course combines field work, labs, lectures, and discussions.

After taking this course you will be able to:

- Sample plants and invertebrates using professional equipment and best ethical practice
- Mount, voucher, digitize, and accession museum/herbarium-quality specimens
- Understand how herbaria and zoological collections are curated
- Discuss the use of zoological and botanical nomenclatural codes
- Perform basic DNA extraction
- Defend, as a professional biologist, the role and contribution of this sort of collections

This course is connected to the following campus-wide learning outcomes of the college: *Disciplinary Knowledge, Information Literacy, and Intellectual Curiosity.*

## Requirements

Academic requirements are waived this semester. There is no required textbook, although different materials will be shared regularly via Moodle. You are responsible of keeping track of all the materials posted there.

## Academic accommodations

All students enrolled in this class who have a documented disability have the right to reasonable accommodations under the American with Disabilities Act. Students requesting accommodations are required to provide documentation of their disability to the Coordinator of Student Success Services. Please present the Accommodation Letter to me before the end of week 1. For more information visit room 314 of the Tredway Library.

## Inclusive and respectful learning environment

Your successful learning in this class will depend on enjoying a professional, collaborative and friendly environment open to exchange and discussion of ideas. I am committed to make time in class and lab a positive environment for learning irrespective of gender, sexual, racial, religious, or other identities. Students are invited to optionally share their preferred names and pronouns with the instructor and classmates. Honesty and courtesy are essential at all times. Any kind of discrimination based on race, class, gender, sexual orientation, national origin, etc. will not be tolerated. Students creating disturbance during class that interferes with the ability of other students to learn or distracts the instructor will be asked to leave.

## Academic integrity

I expect you to maintain the highest ethical standards at all times. Evidence of dishonesty (including cheating, plagiarism or fabrication) during quizzes, research projects, and other evaluations will earn a zero for that assignment. Additional penalties may also apply and the Honor Council will be notified. Please refer to the Honor Code website for more information.

## Etiquette and safety

You are expected to take class time seriously and behave professionally (for example, not making breaks during lectures or discussions). Use of laptops, tablets or smartphones will be allowed in this class at certain times for content-related purposes, and you are encouraged to share your work and activity in Twitter, Instagram, or Tik Tok using the hashtag #324NatHist only during lab work time, never during lectures or discussions. The hashtag #AugieNatHist will be used jointly with the Entomology class. Unauthorized use of electronic devices (including texting or checking social media) will change this policy. Food and drink are not allowed in the lab. You are not allowed to wear shorts, flip-flops, sandals, or tank tops in the lab due to OSHA regulations.

## Credit hour expectations

This course is worth 4 credits. In accordance to federal policy, this means that you are expected to dedicate about 138 hours towards its completion, approximately itemized as follows:

<b>Time in class</b> 37 sessions of 1.25 hrs.....	<b>46 hrs</b>
<b>Field work</b> (either as a class or independent) .....	<b>8 hrs</b>
<b>Independent lab time</b> (for lab assignments).....	<b>20 hrs</b>
<b>Work on written assignments</b> (paper worksheets).....	<b>32 hrs</b>
<b>Study time</b> (vocabulary, theory, quiz preparation, etc).....	<b>32 hrs</b>
	<b>TOTAL: 138 hrs</b>

### **Attendance policy**

Punctual attendance is expected in all classes. Absences may be excused, providing the appropriate documentation, due to illness or professional development (but not travel plans or sports). Absences due to family emergencies need to be approved by the Dean of Students. Every student is allowed two unexcused absences. I *reserve the right* to reduce your grade by 5% for every extra unexcused class absence (including arriving too late or leaving too early).

### **Field work**

A significant part of the field work will take place out of class time. I will try to accommodate a majority of requests to decide on one or two field trips to collect specimens. If you cannot or do not want to join these class trips, you are allowed to complete this work by yourself, since you will be trained during class. Coordinate with me to receive the equipment you may need. If you join a class field trip, you are expected to come ready (both in spirit and outfit) for different weather contingencies and muddy soils.

### **Assignments**

- Lab assignments

Most weeks you will need to do some sort of progress with the specimens you have collected (mount them, prepare labels, etc). You will learn the techniques during class time and will also have time to prepare them then. However, some weeks you will likely need to work independently on your specimens. The lab will be open at designated times agreed upon during week 1 and also at your request if I am in my office. These assignments are due at the end of the last class of every week, typically Friday at 11:10am

- Reading assignments

Most Mondays of the semester you will be required to read *before class* a scientific paper. Some of the texts will be specific research papers and you are not expected to understand every single detail or to do in-depth reading of very long papers, but still you should capture the general idea and relate it to the course content. All the papers that we will be reading are available on Moodle and listed in the schedule below. For each paper, you will also find a worksheet on Moodle that you should complete *beforehand* and turn at the beginning of the class. Once this is done, we will begin a group discussion of the reading material. All students are expected to participate in the discussion.

- Quizzes

There will be four quizzes (multiple choice format) during this course, arranged according to the schedule below. The last of the quizzes will be semi-cumulative (half of the questions will be from content of the first 3/4 of the course).

If you plan to miss a class, communicate with me so you can make up for it *in advance*. Lab assignments can be turned in beforehand working independently, and the reading assignments worksheets can be turned before Monday electronically if you are going to be absent that day. Quizzes cannot be retaken due to an unexcused absence. Considering this, late work will not be accepted except on truly exceptional circumstances at my discretion with a 5% penalty if turned in the 12 hours following the original deadline with a 10% incremental penalty for each day after.

## Assessment and grading

The final grade will be itemized as follows:

A. Lab work (30%). Along the course, you will acquire professional skills of specimen preparation and curation, which is the most significant outcome of the course. In particular, each student will:

- Prepare, image, and digitize five herbarium-quality vascular plant specimens
- Prepare five museum-grade invertebrate specimens
- Perform a DNA extraction of one of their specimens
- Contribute to the assessment of the Ralph Troll myxomycete collection

This outcome is split in 10 assignments, according to the schedule shown below, and each of them will be worth 3% of the grade. Lab assignments will be graded both on a completion basis and on the correct use of the techniques learned during class.

B. Readings and discussions (30%). Each week with a reading assignment (10 total), the worksheet and the student contribution in the discussion will be graded up to 3% of the grade.

C. Quizzes (30%). Quizzes 1, 2, and 3 will have 20 multiple choice questions on the topics included in the schedule. Quiz 4 will have 40 questions (half of them from quizzes 1, 2, and 3, worth twice the normal value).

D. Participation (10%). Due to the nature of this course, your active and regular participation in discussions, field work, organism identification in groups, etc. is required. Creative and meaningful contributions in social media using the class hashtag will also be acknowledged.

Earning a minimum of 50% of the grade in each of the sections is a requisite to pass this course. There is no final exam.

Grading scheme:

98%-100% = A+	88%-89% = B+	78%-79% = C+	60%-69% = D
92%-97% = A	82%-87% = B	72%-77% = C	<60% = F
90%-91% = A-	80%-81% = B-	70%-71% = C-	



## Tentative Class Schedule

Week			Class Topic	Reading assignment Due Monday at 9:55 Group discussion: ♣	Lab assignment Due Friday at 11:10
1	9/2	M	No class	None	None
	9/4	W	Introduction to the course		
	9/6	F	Crash course on vocabulary		
2	9/9	M	♣ Sampling design and training in field work equipment	Tewksbury et al. 2014 Natural History in science and society	Vocabulary worksheet
	9/11	W	Field work demo on campus: plant sampling and pressing. Trap deployment		
	9/13	F	Field work demo on campus and lab. Plant drying. Trap processing		
3	9/16	M	♣ QUIZ 1: Sampling techniques; botanical & zoological vocabulary	Movalli et al. 2017 Biomonitoring of heavy metals	All field work done. Localities + collections report
	9/18	W	Introduction to taxonomy and systematics		
	9/20	F	Fundamentals of scientific nomenclature. Use of nomenclatural codes		
4	9/23	M	♣ Lecture on plant mounting techniques	Willis et al. 2017 Phenology changes with herbarium specimens	Mounted plant specimens
	9/25	W	Plant specimen mounting		
	9/26	F	Plant specimen mounting		
5	9/30	M	♣ Invertebrate vouchering techniques	Sforzi 2018 Citizen Science in the NHM	Vouchered invert. specimens and notes
	10/2	W	Invertebrate specimen vouchering		
	10/4	F	Invertebrate specimen vouchering		
6	10/7	M	Nomenclature case study discussion	None	None
	10/9	W	Symposium Day		
	10/11	F	QUIZ 2: Taxonomy, nomenclature, and specimen preparation		
7	10/14	M	♣ Plant identification 1	Medina et al. 2019 Principle of Priority in moss example	Labelled and complete plant specimens
	10/16	W	Plant identification 2		
	10/18	F	Plant identification and final labels for specimens ready		
8	10/21	M	Fall Break	None	Labelled and complete invert specimens
	10/23	W	Lab: Invert. identification 1		
	10/25	F	Lab: Invert. identification 2 and final labels		

Tentative Class Schedule, cont.

Week			Class Topic	Reading assignment Due Monday at 9:55 Group discussion: ♣	Lab assignment Due Friday at 11:10
9	10/28	M	♣ Organization and curation of natural history collections	<b>Wen et al. 2015</b> Collection based systematics 2050	None
	10/30	W	Specimen typification		
	11/1	F	Workshop: types of the Tulen collection		
10	11/4	M	♣ <b>QUIZ 3: Plant and invert identification. Typification.</b>	<b>Capellini et al. 2013</b> Type specimen of the Asian elephant	Troll's specimen data uploaded
	11/6	W	Introduction to slime molds (myxomycetes). The Troll collection at AUGIE		
	11/8	F	Workshop: assessment of the Ralph Troll collection		
11	11/11	M	♣ Lab: Concepts on DNA barcoding	<b>Renner 2016</b> DNA characters used in formal naming	DNA samples stored
	11/13	W	DNA extraction day 1		
	11/15	F	DNA extraction day 2		
12	11/18	M	♣ Specimen digitization. Purpose, uses	<b>Meierotto et al. 2019</b> Protocol to describe hyperdiverse taxa	Hi-res image of plant specimens
	11/20	W	Plant specimen imaging 1. Online resources		
	11/22	F	Plant specimen imaging 2. Online resources		
13	11/25	M	♣ Digitization of specimens into the Consortium of Midwest Herbaria	<b>Funk 2018</b> Collection based science for the 21 <sup>st</sup> century	Plant specimens fully digitized (due Monday at 11:10)
	11/27	W	Thanksgiving Break		
	11/29	F			
14	12/2	M	Discussion. Ethics, the Nagoya Protocol and natural history collections	None	None
	12/4	W	<b>QUIZ 4. Slime molds, barcoding and digitization + Quiz 1, 2, and 3</b>		
	12/6	F	Debriefing and course evaluation		

Version 1.2 August 2019

Photo credits: Smithsonian Institution