

# Biodiversity of Macrofungi - BIOL 3530/5530 - FALL 2024

Instructor: Dr. Emily Cantonwine; Office: **BC 2218**

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Lecture: MWF 11-11:50 am, BC2202, Lab: M 1-3:50 pm, BC2040

Office Hours: MWF 9-10 am & TR 2-3 pm.

**Course Description** – A survey of the biology and diversity of fungi that produce large sexual sporocarps, with an emphasis on identification. Field trips may be required.

## Required Materials:

- The Kingdom of Fungi (2013) J.H. Petersen
- Digital camera – cell phone camera is perfect
- Mushroom collecting basket/box
- Mushrooms Demystified (1986) David Arora
- Pocket knife or similar
- 10-12X cellphone macrolens attachment, or camera with a comparable capability

## Optional Text:

- A Field Guide to the Mushrooms of Georgia (2023) Bassette, Bassette, and Hopping

## Learning Outcomes:

### Macrofungi Knowledge – At the end of the course, students will be able to...

- Identify macrofungi based on ecological, macroscopic and microscopic data.
- Use mycological terminology to describe characteristics of macrofungi.
- Explain the process of naming and classifying species
- Make accurate field and microscopic observations
- Analyze and interpret DNA sequence results and build cladograms.
- Voucher fungal sporocarps and record digital data.
- Group mushrooms by systematic relatedness.

### Professional Skills – This course will also provide opportunities to improve...

- Accountability
- Self-directed learning
- Knowledge Synthesize
- Attention to detail
- Science Communication
- Professional identity
- Critical thinking
- Collaboration
- Metacognition

**Twisted Student-Centered Instruction** – This course is twisted, which means your training and work will at times be more like that of a biologist than a student. The Twisted Instruction approach is empowering and fun, but a WARNING is needed! Regular homework and in-class participation are required. If this approach does not interest you, please select a different course ASAP so others can join.

**Pedagogy Assessments** – The instructional value of two course activities will be assessed this semester.

- The *Barcoded Collection Project* is endorsed by VSU as an Experiential Learning (EL) activity. EL endorsed activities require student reflections to 1) help students integrate learned skills and concepts at a deeper level, and 2) help faculty and administrators assess the value of the assignments.
- A set of *Twisted Lecture Assignments* will be studied this semester by Dr. Gwen Ruttencutter, an adult learning researcher in the Department of Leadership, Technology, & Workforce Development. You will meet Dr. Ruttencutter and learn more about her study after the Twisted Lecture Assignments begin. This is optional! I am not involved in data collection or analysis and will not know who participates.

## Important Information

- A grade of C or higher is required in the course to count towards a biology degree.
- If you have need for special arrangements to complete the requirements of this course, please contact the Access Office for Students with Disabilities, and discuss this need with me.

## **ASSESSMENTS**

Lecture Assignments: 30%

- (6) Illustrated Species Description Presentations (10%)
- (6) Annotated Dichotomous Key Assignment (10%)
- (6) Phylogeny Assignments (10%)

Lecture Assessments: 35%

- Exam 1 (10%)
- Exam 2 (10%)
- Open note assessments (5%)
- Final Cumulative Exam (10%)

Lab Assignments and Assessments: 30%

- Scavenger Hunt (7.5%)
- Collection Project (7.5%)\*
- DNA/PCR/Sequence Analyses labs (7.5%)\*
- Lab Practical (7.5%)

Barcoding Project (5%)\*

Extra Credit (+2.5%)

- Experiential Learning Reflections\*
- Surprise opportunities here and there

## **SCALE**

A 90-100%

B 80-89.5%

C 70-79.5%

D 60-69.5%

F <59.5%

\* Experiential  
Learning  
Component

## **HOW TO CALCULATE YOUR GRADE**

Point values for each assignment will reflect the time needed to complete or prepare for the assignment and the difficulty of the assignment. Use the 2 steps below to keep up with your grade.

1. PERCENTAGE VALUE FOR EACH ASSESSMENT: **% GRADE = (# POINTS EARNED / # POSSIBLE POINTS) X 100**
2. PLUG YOUR PERCENTAGE VALUES INTO THIS FORMULA: **GRADE = (% Lecture Assignments X 0.3) + (% Lecture Assessments X 0.35) + (% Lab Grade X 0.3) + (Barcoding Project X 0.05) + (% Extra Credit X 0.025)**

## **Assessments**

**Lecture Assignments.** Assignments that include homework and classwork are grouped in this category. Remote work will be accepted with an acceptable excuse. Late work will not be accepted; but make-up assignments will be provided for students who have an acceptable excuse and were not able to participate remotely. Instructions for each type of assignment will be provided in class. *Students may be organized into groups (Group Asco and Group Basidio) so that activities can fit within the 50-min lecture.*

**Lecture Assessments.** Traditional lecture content will be assessed with three closed-notes exams. There will be one early in the semester, a second after midterm, and a cumulative final exam during finals week. Content from the Species Presentation and Dichotomous Key Assignments will be evaluated using open note quizzes; a selection of the content from these assignments (i.e. vocabulary) will be included on the cumulative final exam. Knowledge gained with the Phylogeny activities will be assessed using an open-note quiz, and questions on Exam 2 and the Final Exam.

**Lab Assignments & Assessments.** The lab grade will be based a **scavenger hunt, collection and vouchering project, participation in a set of DNA barcoding labs, and one lab practical.** Details will be provided in lab.

**Barcoding Project.** The results of the EL barcoding project will be presented during lecture using a format similar to the Illustrated Species Description Presentation.

**Extra Credit.** There are three Experiential Learning reflection activities that are required to fulfil the EL grant requirements. Students will receive extra credit for these efforts. Thank you! A handful of other extra credit opportunities will likely arise during the course.

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## **Policies & Expectations**

- Regular, in person attendance is critical for success in this class. However, PLEASE DO NOT attend class if you are sick. I allow remote participation for pre-approved reasons and will allow make-ups for acceptable excuses. Details will be provided in class.
- Lectures & most student presentations are recorded using Kaltura. If you miss a lecture, watch the recording in Media Gallery before the next lecture period.
- If you miss a lab and would like to make it up, contact me within 24hr. A documented excuse is required, and I must find your excuse acceptable. FYI, a non-emergency doctor's appointment is NOT an acceptable excuse.
- Help me maintain a positive learning environment by always being respectful of others. If someone is not being respectful, speak-up or disengage. Don't ruin it for others, and don't bring others down!
- Check your valdosta.edu email and BV Announcements every day.
- Have a mindset that you are in this class to learn. I begin class promptly, so please show up on time!
- I reserve the right to modify my grading scheme and policies at any time.

Title IX Statement: Valdosta State University (VSU) is committed to creating a diverse and inclusive work and learning environment free from discrimination and harassment. VSU is dedicated to creating an environment where all campus community members feel valued, respected, and included. Valdosta State University prohibits discrimination on the basis of race, color, ethnicity, national origin, sex (including pregnancy status, sexual harassment and sexual violence), sexual orientation, gender identity, religion, age, national origin, disability, genetic information, or veteran status, in the University's programs and activities as required by applicable laws and regulations such as Title IX. The individual designated with responsibility for coordination of compliance efforts and receipt of inquiries concerning nondiscrimination policies is the University's Title IX Coordinator: [titleix@valdosta.edu](mailto:titleix@valdosta.edu)

Access Statement: Students with disabilities who are experiencing barriers in this course may contact the Access Office for assistance in determining and implementing reasonable accommodations. The Access Office is ~~located in Farbar Hall~~ temporarily in the University Center Entrance 5. The phone numbers are 229-245-2498 (V), 229-375-5871 (VP) and 229-219-1348 (TTY). For more information, please visit VSU's Access Office or email: [access@valdosta.edu](mailto:access@valdosta.edu).

Academic Integrity: I follow the Academic Honesty Policies and Procedures of the University and the Department of Biology's Policy on Plagiarism. For more information, refer to [www.valdosta.edu/academic/AcademicHonestyPoliciesandProcedures.shtml](http://www.valdosta.edu/academic/AcademicHonestyPoliciesandProcedures.shtml) and [www.valdosta.edu/biology/documents/biologyplagiarism.doc](http://www.valdosta.edu/biology/documents/biologyplagiarism.doc) "Academic Integrity/ Honesty" means performing all academic work without plagiarism, cheating, lying, tampering, stealing, receiving unauthorized or illegitimate assistance from any other person, or using any source of information that is not common knowledge.

## Tentative Schedule – Before Midterm

Week	Lecture	Assignment Due Dates Illustrated Species Description Presentation (SP), Annotated Dichotomous Key Assignment (DK) Class Summary (S), Open note quiz (Quiz)	Lab
August 19-23	M - Introduction W - Lecture F - Lecture		Instruction to the Collection Project, the Scavenger Hunt Project, the DNA Barcoding Project, and the Lab Practical
August 26-30	M - Lecture W - Lecture F - Lecture		Field and Lab Skills
Sept 2-6	Labor Day - No Class M - Lecture W - Dr. C available for Questions		NO LAB
Sept 9-13	<b>F - Exam 1 (Sept 9)</b> W - Dichotomous Key and Species Presentation Intro F - DK1 & SP1 (Practice)	<b>EXAM 1</b> <b>Quiz</b> - via BV due Thursday by 5pm <b>DK1 &amp; SP1</b> - due 10:00 am Friday	Collection project / Scavenger Hunt
Sept 16-20	M - SP2a (Ascos), DK2a (Basidios) - Gilled genera W - SP2b (Basidios), DK2b (Ascos) - Boletes F - Grades returned; Summaries reviewed	<b>DK &amp; SP</b> - due 10:00 am day of Presentation	Collection project / Scavenger Hunt
Sept 23-27	<b>M - Open note Quiz - Class summaries 1-2</b> W - SP3a (Ascos), DK3a (Basidios) - Polypores F - SP3b (Basidios), DK3b (Ascos) - Gasteroids <i>Cantonwine Feedback via BV by 5pm Friday</i>	<b>Quiz</b> - 11-11:50 Monday <b>DK &amp; SP</b> - due 10:00 am day of Presentation	Collection project / Scavenger Hunt
Sept 30 - Oct 4	<b>M - Open note Quiz - Class summaries 1-3</b> W - SP4a (Ascos), DK4a (Basidios) - Clavarioids F - SP4b (Basidios), DK4b (Ascos) - Toothed & Jellies <i>Cantonwine Feedback via BV by 5pm Friday</i>	<b>Quiz</b> - 11-11:50 Monday <b>DK &amp; SP</b> - due 10:00 am day of Presentation	Collection project / Scavenger Hunt
October 7-11	<b>M - Open note Quiz - Class summaries 1-4</b> W - SP5a (Ascos), DK5a (Basidios) - Apothecia F - SP5b (Basidios), DK5b (Ascos) - Perithecia <i>Cantonwine Feedback via BV by 5pm Friday</i>	<b>Quiz</b> - 11-11:50 Monday <b>DK &amp; SP</b> - due 10:00 am day of Presentation	<b>DUE – Collection Project Handouts and vouchered specimens turned in for two collections (SP and DK can come later)</b>

**Tentative Schedule – After Midterm**

Week	Lecture	Lecture Assignment Due Dates	Lab Schedule & Assignment Due Dates
October 14-18	M - No class (fall break) <b>W - Open note Quiz - Class summaries 1-5</b> F - Lecture – updated basidiomycete classification	<b>Quiz</b> - 10-10:50 Wednesday	NO LAB
October 21-25	M - Lecture – phylogeny W - Lecture – barcoding F - Lecture – PCR & Sequencing		<b>DUE - SP6 &amp; DK6 - One of your species Barcoding part 1 - DNA extraction</b>
Oct 28 - Nov 1	M - Phylogeny HW/Activity Introduction W - Phylogeny Activity (Agaricales) F - Phylogeny Activity (Russulales & Boletales)	<b>Phylogeny HW 1</b> - due 10:00 am Monday <b>Phylogeny HW 2</b> - due 10:00 am Wednesday <b>Phylogeny HW 3</b> - due 10:00 am Friday	<b>Barcoding part 2 - PCR</b> Collection Project / Scavenger Hunt
Nov 4-8	M - Phylogeny Activity (Polyporales) W - Phylogeny Activity (Remaining basidio orders) F - Exam Review	<b>Phylogeny HW 4</b> - due 10:00 am Monday <b>Phylogeny HW 5</b> - due 10:00 am Wednesday	Collection Project / Scavenger Hunt
Nov 11-15	<b>M - Exam 2 (Nov 7)</b> W - take home Ascomycete phylogeny assignment F - In-class (Group) Ascomycete phylogeny assessment	<b>EXAM 2</b>  <b>Phylogeny HW 6</b> - due 10:00 am Friday	<b>Barcoding part 3 - Sequence editing</b>
Nov 18-22	M - Barcoding Project W - Barcoding Project <b>F - Open note Quiz - Asco classification</b>	<b>Quiz</b> - 11-11:50 Friday	Collection Project / Scavenger Hunt
Nov 25-29	M – Training for the Barcoding Project Presentations <b>THANKSGIVING</b>		<b>Due - Collection Project</b>
Dec 2-6	M - Dr. C takes questions about Barcoding Projects W - Barcoding Presentations F - Barcoding Presentations cont.	<b>Reports &amp; VT Presentations</b> - Weds, 11 am <b>Reviews</b> - Friday, 11 am	<b>Due - Scavenger Hunt Report</b> <u>Clean-up lab</u> <u>Review for Lab Practical</u>
Dec 9-13	<b>Cumulative FINAL EXAM – Date &amp; Format TBA</b>		<b>Lab Practical</b>

## THE NIBBLE AND SPIT TEST; Not a Screen for Toxicity in Boletes

We all would love to find workable shortcuts to determine if the mushrooms we collect are edible or not. Nothing beats a confirmed identification of what species of mushroom you have and if it is edible. Over time there have been many generalities and short-cuts proposed to make the decision safe and easy. Most are flawed in some way.

The nibble and spit test is suggested for use in three groups of mushrooms; The Boletes, the Russulas and the Milk Caps (*Lactarius* and *Lactifluus*). The test involves taking a small piece of the cap flesh and either touching it with the tongue tip or preferably chewing it slightly in the front of the mouth before spitting it out. Spitting ensures that you are not ingesting more than the smallest amount of the mushroom, if any.

For Russulas and Milk Caps the test determines if the taste is spicy hot and how quickly the heat develops in your mouth. The small red-capped *Russula emetica* group is almost instantly fiery hot, other red Russulas are slowly hot or not at all. Same with the Milk Caps. The idea is that if the mushrooms are not hot they are not toxic. If the mushroom is mildly hot, they may still benefit from boiling before cooking for food. I would recommend NOT using this method on the blackening Russulas following a couple of severe poisonings involving an Asian species *R. subnigricans*. I do not personally recommend use of Nibble and Spit to decide on edibility in this group; I am pretty careful about what I eat.

For the Boletes, Nibble and Spit means tasting a small piece of the flesh that will determine if the mushroom is bitter and therefore unpalatable. It can be an effective way to differentiate between a yummy King Bolete (*B. edulis* group) and a Bitter Tylopilus look-alike. Unfortunately some people make the assumption that it is an effective way to determine edibility and toxicity, which it is not. Though many boletes are edible and a few are edible but bitter, determining bitterness does not rule out a few common and toxic species as some people assume.

I came to this realization after writing a Facebook post about my 1986 poisoning after eating a meal of cooked toxic Lilac Brown Bolete (*Sutorius eximius*). My intention for the post was to raise awareness of this toxic mushroom in the same way I wrote a post on the toxic *Boletus huronensis* (The Hurler). These 2 bolete mushrooms are responsible for dozens of poisonings in New England and Eastern Canada over the past 2 decades as reflected by my consulting role with the regional Northern New England Poison Center and conversations with other poison centers. After each post I had readers ask if the mushroom passed the Nibble and Spit test; was it bitter? For each of these common toxic Boletes the answer is YES, they pass the test, they are not bitter. But if you eat these mushrooms you will most likely suffer from hours of severe gastrointestinal distress. Some people can reportedly eat the Lilac Brown Bolete without problems. Sickenings from the very toxic Hurler can easily result in symptoms requiring inpatient hospital care! When I informed the commenters of this reality, they were surprised, it was new learning for them.

So let's be clear. The Nibble and Spit Test does not test for edibility among boletes! It is vital for any decision to eat a mushroom to be based on knowing the specific type of mushroom and its edibility. No short cuts.

All reactions:  
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