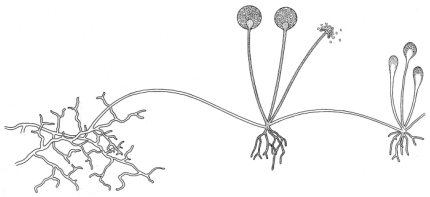
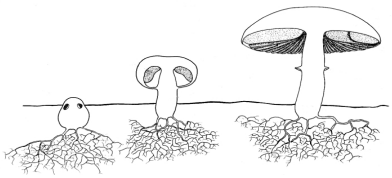




Fungal Biology
PLP 4653C/PLP 6656C

INSTRUCTOR: Dr. Matthew E. Smith
Office: 2527 Fifield Hall
Phone: 352-273-2837
Email: <trufflesmith@ufl.edu>
Office Hours: Monday 4-5 pm or via appointment on Zoom or over the phone.

TEACHING ASSISTANT: Marcos Caiafa
Email: <marcos.caiafase@ufl.edu>

COURSE(S): PLP 4653C and PLP6656C are taught concurrently. Undergraduates are expected to enroll in PLP 4653C whereas graduate students should enroll in PLP6656C. Students enrolled in the graduate course will be responsible for additional writing assignments and will be held to a higher standard for the fungal collections project and for their participation in class discussions based on the primary literature.

PREREQUISITE: PLP3002C *or* BSC 2010 and BSC 2011 *or* consent of instructor

CREDITS: 4

Course Website: https://lss.at.ufl.edu/ (e-Learning in Canvas)

CLASS TIMES & LOCATIONS:

Lectures:	Mondays, 12:50–1:40 pm (Period 6) online via Zoom
Laboratories:	Fridays, 2306 Fifield Hall or at a designated Field Trip Meeting point (details and times TBD)
Final Exam:	**Wednesday, 16 December 2020 @ 7:30 AM - 9:30 AM**

BRIEF DESCRIPTION

Mycology is the study of fungal biology. Fungi are extremely diverse in terrestrial and aquatic ecosystems and they serve as the most important decomposers of organic materials on the planet. Fungi are also ecologically and economically important as symbiotic mutualists and pathogens of a wide variety of plants and animals. The main objective of this course is to provide students with a broad overview of this group of organisms. Much of the class will focus on fungal ecology, fungal diversity, and fungal evolution. During the course, students will: 1) learn about fungi, their biology, and the important impacts they have on humans and natural ecosystems, 2) collect and identify a variety of different fungi from local habitats, and 3) use microscopy to examine the morphology of fungi in the laboratory. We will also read, discuss, and critique modern journal articles that address various aspects of fungal biology.

COURSE OBJECTIVES

By the end of this course, students will be able to:

1. Read, interpret, and critique scientific journal articles focused on fungal biology
2. Locate and use fungal biology resources to interpret fungal nomenclature and systematics
3. Identify major groups of fungi based on morphology (both in the field and in the lab)
4. Understand and explain the ecological roles and trophic modes of major fungal groups
5. Read and interpret a phylogenetic tree
6. Use a dichotomous key to identify local macrofungi to the genus level
7. Perform molecular and computational tasks necessary for DNA barcoding of fungi
8. Give a presentation with appropriate visual aids

9. Provide constructive criticism during a peer review

TEXTS (Suggested):

- Introduction to Fungi. 3rd Edition (2007) Webster & Webster. Cambridge University Press.

- Bessette, A. E., Bessette, A. F., & Lewis, D. P. (2019). Mushrooms of the Gulf Coast States: A Field Guide to Texas, Louisiana, Mississippi, Alabama, and Florida. University of Texas Press.

ABSENCES AND MAKE-UP WORK: Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx. (During the unusual times of the COVID19 pandemic, I recognize that life may be disrupted more than usual. I will be flexible and work with you if there are disruptions due to COVID19 illness or internet connectivity issues. Please contact me directly via email for any issues or problems that arise.)

ATTENDANCE: Attendance is mandatory. This is a highly experiential course - you are expected to participate in every class and laboratory. There will be occasional quizzes and activities that will contribute to your grade in the class. Missed activity grades, tests, and quizzes can be made up for excused absences. Activities in class require that you: 1) have done the readings or other appropriate preparation, 2) show up or log in on time, and 3) actively participate in class. If you have to miss class for any reason please contact me to ensure that we can provide any information that you missed if at all possible.

LABORATORY: The laboratory will emphasize principles and concepts of mycology through demonstrations and hands-on exercises using living organisms and prepared specimens as well as field trips. Labs will be on Fridays and will usually take one of two forms: 1) Field trips or outdoor learning labs where the class will meet at a designated location on campus or very close to campus and conduct learning activities outside from 1-4 pm OR 2) Indoor Lab Activities involving microscopy where the lab will be open for a designated time (typically 9 am to 5 pm) and students will sign up for blocks of time to enter the lab (at 25% capacity with masks at all times). It is advised that you keep a lab notebook for all labs. Your lab notebook will not be graded, but a well-kept notebook will be highly beneficial to you in preparing lab assignments and studying for exams.

EXAMS AND GRADING: Grading is based on a total of 600 possible points for graduate students and 550 points for undergraduates. The grading will be based on a combination of participation in class discussions and laboratory activities, quizzes, a final exam, and several projects. For undergraduates there will be two projects: The Fungi EOL Project and the Fungal Collection Project (see below). Graduate students will complete these projects and will have an additional project (the Famous Mycologist Wikipedia page). These projects will be introduced toward the beginning of the term and students will have opportunities to work on their independent projects throughout the semester. The quiz grade will be based on a series of short quizzes. The final exam will take place on **Wednesday, 16 December 2020 @ 7:30 AM - 9:30 AM**

COURSE PROJECTS:

For the **Fungi EOL project**, students will select a target fungus of their choice (preferably from a designated list of nominated fungi) research the biology of that fungus, and then summarize what is known about the fungus on a webpage for the Encyclopedia of Life (EOL). This project will also involve a peer-review process whereby fellow students will provide constructive feedback to improve the webpage. Students will also give a brief presentation to introduce their fungus to the class.

For the **Fungal Collections Project** students will collect, identify, and preserve 35 species of local macrofungi (one species per genus maximum). Students will have opportunities to learn basic fungi identification skills to help them with this project during labs and field trips throughout the semester.

For the **Famous Mycologist Wikipedia Project**, graduate students will select a mycologist for which there is no Wikipedia page and they will create a page based on publicly available resources. The course participation grade is compiled based on attendance, participation in lecture and lab activities, and active participation during field trips and paper discussions.

Graduate Student Grading

Component	Points
Class & Lab Participation	50
Quizzes	100
Final Exam	100
Fungal Collection Project	200
Fungi EOL project	100
Famous Mycologist Wikipedia page	50
Total Number of Possible Points:	**600**

Undergraduate Student Grading

Component	Points
Class & Lab Participation	50
Quizzes	100
Final Exam	100
Fungal Collection Project	200
Fungi EOL project	100
Total Number of Possible Points:	**550**

GRADES AND GRADE POINTS:
For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Grade points will be assigned as follows.

Letter Grade	**Percentage**
A	95 – 100
A-	90 – 94.9
B+	87 – 89.9
B	83 – 86.9
B-	80 – 82.9
C+	77 – 79.9
C	73 – 76.9
C-	70 – 72.9
D+	67 – 69.9
D	63 – 66.9
D-	60.1 – 62.9
E	60 or below
WF	NA
I	NA
NG	NA
S-U	NA

ACADEMIC HONESTY – As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment*."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as

part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php.

Students are expected to strictly follow these guidelines:

1. Complete their own independent work (unless the assignment has specifically been defined as a group project) and turn it on time.
2. Cite sources in their written assignments so that the veracity of their statements can be independently verified by the instructor.
3. Use quotations to designate text that was generated by another person.
4. Know the definition of the word "plagiarism" and ensure that their academic work does not plagiarise the work of others (**see www.plagiarism.org/**).

SOFTWARE USE – All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

CAMPUS HELPING RESOURCES – Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* **www.counseling.ufl.edu/cwc/**
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs
  - Community Provider Database
- *Career Resource Center,* First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

SERVICES FOR STUDENTS WITH DISABILITIES – The Disability Resource Center (0001 Reid Hall, 352-392-8565, **www.dso.ufl.edu/drc/**)coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

Outline of major topics to be covered in the course:

- Overview of fungal tree of life
- Basics of light microscopy
- History of mycology
- Macrofungi: basic field identification
- Lineage-specific activities for microscopic identification of fungi
- Species- and lineage-level diversity based on morphology and evironmental sampling
- Basic concepts in molecular phylogenetics
- Specimen preservation and herbarium curation
- Emerging fungal diseases of plants and animals
- Encyclopedia of Life fungi exercise and peer review
- Identifying unknown fungi with DNA barcoding and phylogenetic analysis

- Insect-associated and nematode-associated fungi – ecology and systematics
- Species concepts and cryptic species in fungal biology
- Lichen biology and morphology
- Mycorrhizal ecology and evolution
- Fungi as medicines, toxins, and food products
- Fungal sexuality and reproduction
- Fungal endophytes of plants, bacterial endophytes of fungi
- Aquatic fungi – the biology and diversity of the "chytrids"
- Fungi-like organisms: Oomycota and Slime Molds

Course Schedule

- Mondays are totally online via Zoom

- Fridays are labs or field trips (and are subject to change due to weather!)

			Activity	**Assignment**
1	Mon.	Aug. 31	Intro to Course, Syllabus Review & Intro to Fungi 1 & 2	
2	Fri.	Sept 4.	*Outdoor Lab (1-4 pm):* Macrofungi – macromorphology, basics of ID, Agaricomycotina	
–	Mon.	Sept. 7	**Holiday**	
3	Fri.	Sept. 11	*Indoor Lab (open lab 9:30 am - 5 pm):* Microscope Use & Microscopy of Agaricomycetes part 1	**Dichotomous Key exercise**
4	Mon.	Sept. 14	Basidiomycota 1 & 2, Paper Discussion 1	**Fungi Collections Handout**
5	Fri.	Sept. 18	*NATL Field Trip (1-4 pm)**	
6	Mon.	Sept. 21	Basidiomycota 3 & 4, Wood Decay Overview (*Guest Star – Nattapol Kraisitudomsook*) **[Quiz 1]**	**Fungi EOL Exercise Handout**
7	Fri.	Sept. 25	*Indoor Lab (open lab 9:30 am - 5 pm):* Microscopy of Agaricomycetes part 2 (Gasteromycetes and wood decay fungi) DNA Barcoding (part 1)	
	Mon.	Sept. 28	Ascomycota 1 Ascomycota 2 Paper Discussion 2 **[Quiz 2]**	**Wikipedia page handout (grad students only)**
	Fri.	Oct. 2	*Indoor Lab (open lab 9:30 am - 5 pm):* Microscopy of Other Basidiomycota (Rusts, Smuts and Jellies)	
	Mon.	Oct. 5	Ascomycota 3 (*Guest Star – Dr. Rosanne Healy*) Paper Discussion 3	
	Fri.	Oct. 9	*Lake Alice Field Trip (1-4 pm)**	
	Mon.	Oct. 12	Ascomycota 4 **[Quiz 3]**	
	Fri.	Oct. 16	*Indoor Lab (open lab 9:30 am - 5 pm):* Ascocarp morphology	
	Mon.	Oct. 19	Secondary Compounds from Fungi Paper Discussion 4	
	Fri.	Oct. 23	*Indoor Lab (open lab 9:30 am - 5 pm):* Asexual states of Ascomycota	
	Mon.	Oct. 26	Lichen Lecture & Lichen Online Lab **[Quiz 4]**	**Wikipedia page due (grad**

				students)
	Fri.	Oct. 30	Molecular Identification and Tree Building – Online Lab Exercise w/ Results from DNA barcoding (*Guest Star – Dr. Arthur Grupe*)	
	Mon.	Nov. 2	Mycorrhizal Symbiosis Paper Discussion 5	**Fungi EOL Peer review (online)**
	Fri.	Nov. 6	*Indoor Lab (open lab 9:30 am - 5 pm):* Fungal Collections Microscopy	
	Mon.	Nov. 9	'Zygomycete" Fungi (*Guest Star – Nicole Reynolds*) Fungal-Animal Symbioses	
	Fri.	Nov. 13	Indoor Lab: 'Zygomycete' Morphology	
	Mon.	Nov. 16	Chytrids, Bacteria-Fungi Interactions (Guest Star – Dr. Jessie Uehling) **Fungi EOL Videos Due**	**Fungi EOL Assignment Due**
	Fri.	Nov. 20	*Indoor Lab (open lab 9:30 am - 5 pm):* Fungal Collections Microscopy	
	Mon.	Nov. 23	Animal-Fungi Interactions, Paper Discussion 6, **[Quiz 5]**	
	Fri.	Nov. 27	**Holiday**	
	Mon.	Nov. 30	Slime molds and Oomycota	
	Fri.	Dec 4	Molecular Ecology Online Lab (Guest Stars – Marcos Caiafa & Dr. Michelle Jusino)	
	Mon.	Dec 7	Fungi for food & food production, Final Review	**Fungi Collections due at Fifield Hall**
			Final Exam – ***Wednesday, 16 December 2020 @ 7:30 AM - 9:30 AM***	

**Field trips are outside activities. Please wear appropriate clothes and shoes. Prepare to be outside!

Assigned readings for Paper Discussions

Discussion 1 – Species-level and Deep-level Phylogenetic Diversity

- James TY, Stajich JE, Hittinger CT, Rokas A. (2020) Toward a fully resolved fungal tree of life. Annual Review of Microbiology. 13: 291-313.

- James et al. (2006) Reconstructing the early evolution of fungi using a six-gene phylogeny. Nature. 443: 818

Discussion 2 – Speciation and Species Boundaries

- Taylor et al. (2000) Phylogenetic species recognition and species concepts in fungi. Fungal Genetics and Biology. 31: 21–32.

- Passer AR, Coelho MA, Billmyre RB, Nowrousian M, Mittelbach M, Yurkov AM, Averette AF, Cuomo CA, Sun S, Heitman J. 2019. Genetic and genomic analyses reveal boundaries between species closely related to *Cryptococcus* pathogens. MBio 25;10(3). 10:e00764-19. DOI: 10.1128/mBio.00764-19

Discussion 3 – DNA Barcoding and Sequence-based Classification

- Gazis et al (2011) Species delimitation in fungal endophyte diversity studies and its implications in ecological and biogeographic inferences. Molecular Ecology. 20: 3001-3013

- Lücking R, Aime MC, Robbertse B, Miller AN, Ariyawansa HA, Aoki T, Cardinali G, Crous PW, Druzhinina IS, Geiser DM, Hawksworth DL. 2020. Unambiguous identification of fungi: where do we stand and how accurate and precise is fungal DNA barcoding?. IMA Fungus. 11(1):1-32.

Discussion 4 – Fungal Symbioses

- Peay et al. (2007) A strong species–area relationship for eukaryotic soil microbes: island size matters for ectomycorrhizal fungi. Ecology Letters 10: 470-480.
- Policelli et al. (2019) Suilloid fungi as global drivers of pine invasions. New Phytologist. 222:714-725.

Discussion 6 – Using molecular data to discover fungi in the environment

- Tedersoo et al. (2017) Novel soil-inhabiting clades fill gaps in the fungal tree of life. Microbiome. 5(1):42

- Torres-Cruz et al. 2017. *Bifiguratus adelaidae*, gen. et sp. nov., a new member of Mucoromycotina in endophytic and soil-dwelling habitats. Mycologia 109(3):363-78

- James TY, Seifert KA. 2017. Description of *Bifiguratus adelaidae*: The hunt ends for one of the "Top 50 Most Wanted Fungi." Mycologia 109(3): 361-362 (A short commentary on Torres-Cruz et al. 2017)

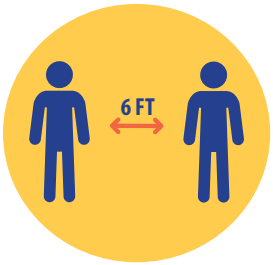
Discussion 7 – Animal Pathogenic Fungi

- Lips et al. 2006. Emerging infectious disease and the loss of biodiversity in a Neotropical amphibian community. Proceedings of the National Academy of Sciences. 103(9):3165-3170.

- Palmer et al. 2014. Molecular characterization of a heterothallic mating system in *Pseudogymnoascus destructans*, the fungus causing white-nose syndrome of bats. G3: Genes, Genomes, Genetics. 4(9):1755-63.

STOP THE SPREAD

STEPS BELOW CAN CONTAIN THE SPREAD OF COVID-19



- Limit physical contact and interactions with each other. Do not hug or shake hands. When possible, remain 6 feet apart from one another.
- Cover your nose and mouth with a cloth face covering.
- Use a tissue to cover your mouth and nose when coughing or sneezing and dispose of it in a lined trash bin.
- Wash your hands with soap and water for at least 20 seconds after you use the restroom, before and after preparing food, after you sneeze or cough into a tissue, before you leave home, and right after you get home.
- Do not touch your eyes, nose and mouth throughout the day.
- Do not share personal items: cell phones, dishes, drinking glasses, cups, eating utensils, towels or bedding.
- Do not share tools or harvesting equipment.
- Bathroom and handwashing facilities must be cleaned and sanitized each day. If not, immediately inform your supervisor.
- At least once a day clean and disinfect phones, remote controls, counters, tabletops, doorknobs, bathroom fixtures, toilets, keyboards, tablets and bedside tables.
- Inform your supervisor immediately if you feel sick or have any symptoms. Do not leave your housing area and do not visit public areas.

Seek Medical Help for COVID-19 Symptoms*

Persistent Cough

Fever: 100.4+

New Loss of Taste or Smell

Muscle Pain/ Headaches

Shortness of Breath

Sore Throat

**Other symptoms may include chills, diarrhea or feeling ill in any other way.*

Where to get tested for COVID-19 in Florida

- Visit https://floridahealthcovid19.gov/testing-sites/ for the most updated information about testing sites.
- Call 1-877-888-7468 for general COVID-19 information.

Cleaning and disinfecting your home. *https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/disinfecting-your-home.html*

Caring for someone sick at home. *https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/care-for-someone.html*

Get the facts about corona virus. *https://www.cdc.gov/coronavirus/2019-ncov/index.html*

Department of Health in Florida. *http://www.floridahealth.gov*

UF Health Screen, Test & Protect.
Screen. Test. Protect.
Learn more at Coronavirus.UFHealth.org

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