

PLHL 7051
Advanced Mycology
Population Biology of Fungi
Fall 2019

Instructor: Dr. Vinson P. Doyle, LSB 324, email: vdoyle@agcenter.lsu.edu; phone: 225-578-4052

Course Overview:

This course is intended to serve as an introduction to the population biology of fungi. I will be assuming, however, that you already have been introduced to fungal biology via an introductory mycology course (e.g. PLHL 4054). We will explore how population biology, particularly population genetics/genomics, can enhance our understanding of the biology of fungi. This is not, however, a course in population genetics. We will introduce some important terminology in population genetics so that we can begin looking into the primary literature, but this course will not be a substitute for a course in population genetics. The goal is for you to understand the applications of population biology for making inferences about the evolutionary processes that have shaped fungal populations and species.

MEETING TIMES:

Monday & Wednesday – 1:30-2:50 p.m.

Location: Life Sciences Annex A465

OFFICE HOURS:

By appointment only. Contact me via Slack to setup an appointment. Please do not stop by my office without setting up an appointment.

REQUIRED TEXT:

1. **Milgroom, M.G.** (2015). Population Biology of Plant Pathogens: Genetics, Ecology, and Evolution. Minneapolis, APS Press.
2. Student-selected peer-reviewed journal articles.
3. Other assigned reading.

SUPPORTING MATERIAL:

1. **Burnett, J.** (2003) Fungal Populations and Species. Oxford University Press.
2. Review articles.

GRADING:

Paper Discussion Leader:	30%
Quizzes/In Class Assignments:	25%
Project Presentation:	30%
Participation:	15%

COURSE COMMUNICATIONS:

I have setup a Slack team for our class to use. I will setup a #General channel for communicating course related announcements. There will be a #random channel for communicating random things related to fungal population biology. There will also be a #papers channel for you to upload papers once they have been approved and a #Discussion channel to post questions and answers related to the reading. The #R channel is to discuss your R projects, including posting code and asking for help/helping your classmates.

Please use this resource to help one another. You will not be graded based on any postings in slack except you are expected to post your selected paper to slack at least one week prior to the classroom discussion.

ASSIGNMENTS AND RUBRIC:

PAPER DISCUSSION LEAD: Each student is expected to lead the discussion for three papers during the course of the semester. You will be assigned a broad subject area based on the approaches outlined by Grunwald et al. 2016 (Table 1), but you are expected to find a specific paper that applies population-level sampling to make inferences about one or more species. You are required to find a relevant paper **published within the last 10 years** and get approval from Dr. Doyle at least **2 weeks prior to the date on which you are leading the discussion. In order to find a suitable paper, you will probably need to read at least a few papers to make your selection. DO NOT come to Dr. Doyle with a paper selection without having read it first.**

It is likely that each student will need to do outside reading in order to comprehend the paper and lead a discussion. You are not expected to be able to explain the mathematics of population genetics, but you should try to understand the concepts. You do need to be familiar enough to explain the relevance and impact of analyses in the papers you choose to discuss.

Quizzes/In Class Assignments: There will be two sources of the quizzes and in-class assignments, fellow students and Dr. Doyle. Dr. Doyle will have questions related to the reading or exercises he assigns that you will work on individually and in groups and turn in for credit. **Each person leading a paper discussion is also required to prepare a minimum of three questions that challenge their classmates to think beyond the facts presented in the selected papers. Students writing the quiz as well as students taking the quiz will be graded. Students writing the quiz are also required to provide written responses to their own questions at the time the quiz is given in class.**

Project Presentation: Each student is expected to learn to use an R package related to population biology and present its functions and applications in a 15-minute presentation at the end of the semester using your own data or published data. A few minutes of background should be given on the organism represented by the data and how the data was collected (sampling and marker/phenotypic data). **The deadline for selecting the R package and the dataset you will use is October 14th.** Your selection must be done via direct message to Dr. Doyle in Slack. Dr. Doyle will ask to see the data, so make sure you can obtain the data and have examined it before choosing your project.

Participation: Thoughtful discussions are only possible if there is participation among all members of the group. You are expected to engage in all class discussions about the reading material. In order to do so, you need to be prepared. Preparation includes, but is not limited to, reading the papers/book chapters, and looking for answers to questions that arise while you are reading the paper. If you do not know the meaning of a word or the concept represented by a particular statistical test, you should take the time to look it up before coming to class so we can focus on discussing the applications and implications of the research, rather than spending the entire class period defining terms that could have been looked up in reference material.

Class Schedule (Subject to Change)

Date	Topic	Reading
9/04/2019	Syllabus, Introductions	Burnett, Chapter 1
9/09/2019	Intro to Population Genetics of Fungi, markers, and sampling	Milgroom, Chapter 1: All Milgroom, Chapter 2: pp. 13-18 ¹ ; 21-25 ² ; 27-32 ³ Milgroom, Chapter 3: 37-45 ⁴
9/11/2019	Comparative Population Genetics and Demography	Milgroom, Chapter 3: pp. 45-57 Milgroom, Chapter 4: pp. 59-62 ⁴ ; 68-70 ⁵ ; 72-75 ⁶
9/16/2019	Comparative Population Genetics and Demography	Chapter 6: All Read Chapter 7 on your own.
9/18/2019	Computing	Introduction to R – CRAN, RStudio
9/23/2019	Seminar Discussion	TBD – Comparative Population Genetics/Genomics
9/25/2019	Seminar Discussion	TBD – Demography
9/30/2019	Seminar Discussion	TBD – Comparative Population Genetics/Genomics
10/02/2019	Phylogenetics	Tree thinking, multiple sequence alignment (MSA)
10/07/2019	Phylogenetics	Sequence retrieval and MSA practical
10/09/2019	Phylogenetics	Tree Inference methods
10/14/2019	Phylogenetics	Tree inference in R for practice
10/16/2019	Seminar Discussion	TBD – Comparative Population Genetics/Genomics
10/21/2019	Seminar Discussion	TBD – Demography
10/23/2019	Computing	R – Independent Project session
10/28/2019	Seminar Discussion	TBD – Demography
10/30/2019	Natural Selection and Gene-for-Gene (GFG) evolution	Milgroom, Chapter 5: All Milgroom, Chapter 9: All
11/04/2019	GFG cont'd and Genome-Wide Association Studies (GWAS)	Milgroom, Chapter 9: All; Chapter 10: pp. 249-250; Box 10.1 Milgroom, pp. 326-327 Milgroom, pp. 33-35
11/6/2019	TBD	TBD
11/11/2019	Seminar Discussion	TBD – Genes under selection or GWAS
11/13/2019	Seminar Discussion	TBD – Genes under selection or GWAS
11/18/2019	Seminar Discussion	TBD – Genes under selection or GWAS
11/20/2019	Computing	R – Independent Project session
11/25/2019	Computing	R – Independent Project session
11/27/2019	Thanksgiving	No Class
12/2/2019	Presentations	
12/4/2019	Presentations	

¹Read thru “Phenotypic Markers” section

²Read just “Microsatellites” section up to “Discovery of Microsatellite Loci”

³Read section on “Single Nucleotide Polymorphisms” and “Ascertainment Bias”

⁴Read up to “Estimating Mutation Rates in Bacteria”

⁵Read up to “Bottlenecks in Viruses”

⁶Read up to “Mutation and Drift”