

## Fundamentals of Evolution Lab, 11:216:252, Spring 2023

**Time:** Mondays 8.30 AM – 11.30 AM PM (section 1), 12.10-3.10 PM (section 2).

**Place:** 193 Foran Hall, except field trips

<b>Instructors:</b>	Dr. Siobain Duffy	Dr. Lena Struwe
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<b>Office hours:</b>	per e-mail appointment	per e-mail appointment

**Teaching assistant:** Samantha Gigliotti (samantha.gigliotti@rutgers.edu); Ryan Schmidt (ryan.schmidt@rutgers.edu)

**Office hours:** per e-mail appointment

**Credits:** 1 (one 2-period lab/week)

**Course Prerequisites:** General Biology [11:119:101/102], [11:119:115/116], or [11:216:101] or permission of instructor.

**Co-requisite:** 11:216:251 (Fundamentals of Evolution) or 11:216:486 (Principles of Evolution)

**Course Description:** This is the companion lab to the lecture class Fundamentals of Evolution (11:216:251). The lab includes hands-on activities indoors and during field trips to investigate, test, reconstruct, and observe evolution in a broad sense. Major topics will be phylogenetic understanding and reconstruction, species concepts and boundaries (including DNA barcoding), population evolution, and evolution at the molecular level.

**Course website:** This course is on Canvas, <https://canvas.rutgers.edu/>

**Technical Requirements:** All students need to have access to a computer and internet so they can review information on the Canvas website. If you participate remotely you will need to have a functioning webcam, speakers, and microphone to interact with the instructor.

### Learning Goals for Lab:

1. Understanding the role of mutations and variations in phenotype and genotype in natural selection and other evolutionary processes.
2. Understanding and performance of the methods of PCR and DNA sequencing, and the use of DNA barcodes to identify species.
3. Understanding of phylogenetic reconstruction based on molecular data using freely available software.

**Course materials:** Lab manual texts, including excerpts from primary literature, data sets, software manuals, lab protocols, and contemporary press will be available on the course website.

**Bring your evolution lecture course textbook to use as a reference for the first 3 labs.** The lab worksheets will have important information on them as well and should be reviewed. **You will need to have a laptop to bring to class for the latter part of the course, at least one per lab group.**

**Course Requirements, Attendance, and Assignments:** There is mandatory attendance for all lab course components, and your participation is a large proportion of the final grade. **We will take points off for late arrival, non-participation, leaving early without TA or instructor**

**permission, or any other behavior that interferes with your and your classmates' learning and our teaching.**

If you are sick or unable to get to campus because of emergencies such as inclement weather or transportation issues, email all instructors by 8am the day of lab, and we might be able to provide some make-up work for the first 4 labs (and this is decided on a case by case basis). If you are sick, you should report your absence through the Rutgers absence reporting website (<https://sims.rutgers.edu/ssra/>), you will be excused from attending the lab, but the lab will have to be made up, unless other arrangements are made with the instructors. Non-medical and approved non-emergency absences from both class and the remote option will count as zero attendance and no make-up will be offered (unless special arrangements have been made well in advance).

Written, detailed and well-thought-out individual **lab reports are due at the end of each lab** (except during some parts of the final project). These are handwritten reports on lab worksheets for students that attend in-person; students with non-illness emergencies will submit electronic reports online, same deadline.

**Plant Molecular Evolution In-class lab project:** In this project you will select a plant that grows in the teaching collection at Rutgers' Floriculture greenhouse, check its species identification and typical characters, learn how to look up phylogenetic, geographic, and taxonomic information about this plant, press a herbarium voucher specimen, extract its DNA, run PCR, check the PCR results through electrophoresis, sequence two DNA fragments, use one sequence for DNA barcoding (taxon identification or confirmation), download sequences from related plants from Genbank, select an outgroup, make a DNA alignment of many sequences, run a phylogenetic analysis using parsimony, run bootstrap analysis for branch support, evaluate phylogenetic results, and present your scientific results visually and verbally. **For this project you work in pairs and some of the grading is team grades. We will assign all students to teams starting week 5.** The project on Plant Molecular Evolution requires a final oral presentation. Lab partners will present one set of presentation slides that will be graded for both students, but each will be evaluated independently in their oral presentation. Draft figures that are submitted are also graded for the team as a whole. It is the responsibility of everyone in the team to communicate efficiently, upload assignments on time, and share the work load fairly.

**Examinations and Grading:** Grades will be based on:

Syllabus quiz	10 pt
Lab reports	100 pt (10 pt/lab for 10 labs)
Plant Molecular Evolution Project (Initial Figures)	10 pt
Plant Molecular Evolution Project (oral)	20 pt
Plant Molecular Evolution Project (presentation slides)	20 pt
<u>Attendance and participation</u>	<u>39 pt (3 pt/lab for 13 labs)</u>
Total	199 pt

Final letter grades will be based on: 90-100% (A), 85.1-89.9% (B+), 80-85% (B), 75-79.9% (C+), 70-74.9 (C), 60-69.9 (D), below 60% (F).

**Late submission policy:** If you submit your late work less than 24 hours late you get 20% taken off your grade (so, 2 pt deduction from your grade on a 10 pt assignment), if 24-48 hours late you get 40% taken off your grade, and if more than 2 days late you get zero on the assignment. The deduction is taken off your graded points, not from the maximum grade.

**How to ask a question:** We ask you to post your general class questions to the Canvas discussion board, so it can serve as a hub of FAQ's. If you e-mail us (appropriate for personal queries), always include class name/number and your full name since we teach many classes and students. **A VERY IMPORTANT RULE:** You will not get a response if the answer to your emailed question is available on the course website and/or in the syllabus/schedule posted online (the most updated version of the course information will always be posted online). Check the Canvas site and post your question on the discussion board before e-mailing.

**Rutgers Academic Integrity Policy:** You are personally responsible for adhering to the entire policy (Review resources and policy here: <http://academicintegrity.rutgers.edu/>). This means, for example - **DO NOT CHEAT, DO NOT COPY TEXT FROM THE INTERNET** (= write everything in your own words), **DO NOT USE CHATGPT or other AI writing tools, DO NOT PARAPHRASE, AND CITE SOURCES OF FACTUAL INFORMATION AND ANY QUOTES. Do not use any images** from the internet or other sources unless you have specific permission, they are creative commons licensed, or they are in the public domain (see special handout on the course website). If you use your own images, indicate yourself as the source and/or copyright holder. We report all instances of improper Student Conduct to the Office of Student Conduct for processing and violations may result in a zero grade on assignments or worse.

**Not written in stone:** This syllabus is not a contract. It is the planned course outline. Items may be added, subtracted, or changed at the discretion of the professors. The most recent on-line version of the syllabus takes precedence over any earlier printed copies.

**Electronic devices: Texting/social media use or similar activities on any type of device is not permitted at any time** during the lab, unless specifically permitted by the teacher for specific assignments. Devices can only be used for activities that are relevant to this class (taking notes, hands-on projects, looking up relevant information, etc.). The instructors and TA will ask students that do not adhere to this policy to leave the classroom, and such activities will affect your participation and attendance grade.

### **Statement on diversity and inclusion**

It is our intention that students of all backgrounds and abilities will be well served by this course. We will work to create an environment of inclusion that respects and affirms the inherent dignity, value, and uniqueness of all individuals, communities and perspectives. We are lucky to have a diverse university. Diverse voices and life experiences enhance the learning process and we welcome students to share their personal experiences. We will not tolerate disrespectful language or behavior against any individual or group. If you feel as though you have been disrespected or treated unfairly by the instructors or any other individual please let us know. You may speak with the instructors in person, over email or report anonymously using the feedback note box. You may also report bias to Rutgers Diversity and Inclusion initiative using this link: <http://inclusion.rutgers.edu/report-bias-incident/>

### **Land acknowledgement**

We acknowledge that we will be conducting class on the traditional homelands of the Lenape people. “To recognize the land is an expression of gratitude and appreciation to those whose territory you reside on, and a way of honoring the Indigenous people who have been living and working on the land from time immemorial. It is important to understand the long-standing history that has brought you to reside on the land, and to seek to understand your place within that history. Land acknowledgements do not exist in a past tense, or historical context: colonialism is a current ongoing process, and we need to build our mindfulness of our present participation. It is also worth noting that acknowledging the land is Indigenous protocol.” (Sourced from <http://www.lspirg.org/knowtheland/>)

### **Student Wellness Services**

School and life (especially in a pandemic) can get stressful, and Rutgers has many ways to get help. We can offer a Safer Space and help you connect to these resources, but as instructors we have a mandatory duty to report some issues and concerns to the appropriate offices at the University. We can offer you privacy and discretion, but not confidentiality. The faculty and staff at Rutgers are committed to your success. Students who are successful tend to seek out resources that enable them to excel academically, maintain their health and wellness, prepare for future careers, navigate college life and finances, and connect with the RU community. Resources that can help you succeed and connect with the Rutgers community can be found at <https://success.rutgers.edu>

### **Counseling, ADAP & Psychiatric Services (CAPS)**

(848) 932-7884 <http://health.rutgers.edu/medical-counseling-services/counseling/>  
CAPS is a university mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students’ efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

### **Violence Prevention & Victim Assistance (VPVA)**

(848) 932-1181 <http://vpva.rutgers.edu>  
The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling, and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To talk to someone 24/7, call 848-932-1181.

### **Rutgers Student Food Pantry**

848-932-5500 <http://ruoffcampus.rutgers.edu/food/>  
Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. Furthermore, please talk to me if you are comfortable in doing so. A 2018 survey found that 1/3 of all students at Rutgers have experienced food insecurity at some point during the semester. You are not alone and we are here to help.

### **Disability Services**

(848) 202-3111 <https://ods.rutgers.edu/>

Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway  
Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation:

<https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/getting-registered>

**SCHEDULE** (see website for further details)  
Class meets in Foran 193 unless otherwise specified

<b>Monday 30 January (week 1)</b>	<b>Classification, evolutionary trees, and characters.</b> [Note the date! There is no lab class the first week of classes]
<b>Monday 6 February (week 2)</b>	<b>Fossils and geological time. <i>FIELD TRIP: Rutgers' Geology Museum</i></b> , meet at 85 Somerset Street, New Brunswick, NJ (College Ave Campus) at start of class (note, parking is not available at the museum, plan transport accordingly). The museum is on the second floor in the building.
<b>Monday 13 February (week 3)</b>	<b>Mutation, Drift, and Selection.</b>
<b>Monday 20 February (week 4)</b>	<b>Biodiversity and the Tree of Life.</b>
<b>Monday 27 February (week 5)</b>	<b>Plant Biodiversity, adaptation, and DNA sampling of plants. <i>FIELD TRIP: Floriculture greenhouses</i></b> , meet at 64 Nichol Ave, New Brunswick (Cook Campus) at start of class (walking distance from Foran Hall).
<b>Monday 6 March (week 6)</b>	<b>Plant Molecular Evolution Project I:</b> DNA extraction; finding botanical evolutionary information (literature research).
<i>March 11-19</i>	<i>Spring Break</i>
<b>Monday 20 March (week 7)</b>	<b>Plant Molecular Evolution Project II:</b> PCR.
<b>Monday 27 March (week 8)</b>	<b>Plant Molecular Evolution Project III:</b> Electrophoresis, DNA properties, GenBank overview, Installation of MEGA on student computers, run first test dataset to make sure it works, get familiar with MEGA.
<b>Monday 3 April (week 9)</b>	<b>Plant Molecular Evolution Project IV:</b> Using MEGA (DNA training matrix, phylogenetic analyses, consensus trees)
<b>Monday 10 April (week 10)</b>	<b>Plant Molecular Evolution Project V:</b> Phylogenetic Analysis of Project Data (download data from Genbank, DNA alignment in MEGA, set up matrices)
<b>Monday 17 April (week 11)</b>	<b>Plant Molecular Evolution Project VI:</b> Phylogenetic Analysis of Project Data (run analyses, get results, prepare figures). <b><i>DEADLINE for INITIAL FIGURE SUBMISSION</i></b>
<b>Monday 24 April (week 12)</b>	<b>Plant Molecular Evolution Project VII:</b> Phylogenetic Analysis of Project Data, Preparation of Group Presentation.
<b>Monday 1 May (week 13)</b>	<b>Plant Molecular Evolution Project VIII:</b> Final team presentations (verbal + slides). <b><i>DEADLINE for POWERPOINT PRESENTATION</i></b>