Principles of Evolution Laboratory
BIOL 4261/5261
Fall 2026

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Office Hours: 5:15 – 6:15 p.m. on Tuesdays (or by appointment).

Lab Meeting Location: GAB 550

Lab Meeting Time: Tuesdays from 2:25 p.m. – 5:15 p.m.

Text: Tobler, M (2023) *A Primer of Evolution: An Introduction to Evolutionary Thought: Theory, Evidence, and Practice* (open-source text book, available here: https://michitobler.github.io/primer-of-evolution/index.html)

Using the R Programing Language to Understand Evolutionary Principles:
This course will capitalize on the R programming language in order to improve data literacy and enhance your understanding of evolutionary concepts. R and its user-interface program, R Studio, are open-source software packages that are available for both Mac and Windows operating systems. The R programming language is widely used within the biological sciences, and there are countless resources available online to help you learn to code for the purposes of analyzing and visualizing data. For this course, you will be expected to learn the basics of R in order to analyze, model, and visualize data that will illustrate key evolutionary principles.

Instructions on downloading and installing R and R Studio can be found here: https://posit.co/download/rstudio-desktop/

While the computer lab we will be working in (GAB 550) will have computers with R and R Studio pre-installed, you may also want to install these open-source packages on your own personal computer so that you can practice coding in R outside of the established lab times.

Canvas:
Information pertaining to the lab will be posted on the Canvas website at https://unt.instructure.com. This may include materials for R Tutorials, updates to labs,

assignment instructions, supplemental readings, or announcements. Your grades will be posted on Canvas so you can monitor your progress over the semester. It is wise to make a habit of checking Canvas at least once a day so you do not miss important announcements.

Grades:
The goal of this lab is to expand and develop the concepts introduced in lecture. We will do this primarily using the R programming language in the R Studio coding environment. These R labs will be composed of an R Tutorial that you will access through an R Markdown script that will include conceptual background material, example code, questions, and prompts for you to engage with, visualize, and analyze data. You will complete these labs using R in R Studio, and then "knit" your completed lab into an .html R Notebook file that will be submitted through Canvas (40 points per completed lab). Additionally, each R Lab will include post-lab questions that you will answer in a quiz on Canvas (summing to 10 points total each week) that will assess your understanding of the labs and associated evolutionary concepts. Lab R Notebooks will be graded on the completeness of your notebook (i.e., did you fulfill the requirements of the lab) and on quality of the code, data analyses, and answers you provide. Post-lab questions will be a series of multiple-choice, matching, and other questions that will be graded in Canvas based on correctness. You are always encouraged to ask questions if you are not clear about lab concepts. ***For all computer-based labs, your R Lab Notebooks must be checked by your TA and uploaded to Canvas before you leave the computer lab on the day of your lab. Your post-lab questions must be completed in Canvas by 11:59 p.m. on the Friday after your lab.***

In addition to computer-based labs, there will be two in-class Article Discussion labs, where you will give group presentations on articles related to the following subjects: Mutation, Genetic Variation and Adaptation (October 7th) and the Evolution of Social Behavior (October 28th). These articles will be chosen by your group, and you will present them as a group to the class during lab time. You will have the freedom to choose any peer-reviewed article of your interest, so long as it is published (within the last five years) in a reputable scientific journal and is about the respective subject area defined above. These presentations will be 15-minute PowerPoint presentations that will be graded based on a rubric that will be provided to you before you present. You will obtain 40 points for your presentations, and 10 points for participating in the discussions following other group presentations. You are highly encouraged to formulate your groups ahead of time (4-5 people per group) so that you can select your paper in advance. If you have questions about the eligibility of your paper, you are encouraged to share it with your instructor or TA well before your presentations. Finally, there will be a peer-evaluation component of your Article Discussion presentations, where your participation in the group project will be graded (on a scale of 1-10) by each of your peers, and the average of this score will be applied to the 40 points for these presentations. For example, if you got an average of 9/10 for evaluations from your peers and you got all 40 points for your presentation, your peer score would be converted to a percentage (90%) and that percentage would be applied to your

presentation score, giving you a score of 0.90 * 40 points = 36 points. Note that your participation score (i.e., the 10 points for asking questions about other presentations) will be scored separately, in the lab, by your TA and/or course instructor.

Discussion-based labs are a chance for you to develop your understanding of evolution through conversation and debate with your peers and the teaching assistant. If you are hesitant about voicing your opinion in class, be assured that your opinion and level of knowledge will be respected in this class (see General Lab Rules). ***However, discussion-based labs only work if students participate. If you choose not to participate in discussions about other group papers, you will lose points on Article Discussion labs!***

Finally, you will receive 100 points for final group projects (2-3 people per group) that will occur at the end of the semester. ***For undergraduates,*** you will select one type of analysis that you learned in this lab and then perform that analysis on a real dataset that you obtain from an open-source archive (e.g., GenBank, Dryad, datasets obtained from a published paper). Your TA will go over where you can find these datasets, and how to cite them. Once you have analyzed the data, you will prepare a 15-minute PowerPoint presentation that you present to the class as a group. This presentation will be worth 80 points, and you will receive an additional 20 participation points by asking questions and having discussions at the end of other group presentations. ***Graduate students*** will also be required to give a group presentation (80 points), but this will be a 30-minute presentation based on the meta-analyses they perform for the Review Paper they write for the lecture portion of the class; they will be required to employ at least three analytical approaches we covered in the lab and the presentation will be based on these analyses. Like undergraduates, graduate students will also be graded (20 points) based on their participation in questions and discussion following other group presentations. Similar to your Article Discussion presentations (see above), for both graduate and undergraduate students, there will be a peer-evaluation component of your group presentations, where your participation in the group project will be graded (on a scale of 1-10) by each of your peers, and the average of this score will be applied to the 80 points for these presentations. For example, if you got an average of 9/10 for evaluations from your peers and you got all 80 points for your presentation, your peer score would be converted to a percentage (90%) and that percentage would be applied to your presentation score, giving you a score of 0.90 * 80 points = 72 points. Note that your participation score (i.e., the 20 points for asking questions about other presentations) will be scored separately, in the lab, by your TA and/or course instructor.

In total, all labs, assignments, presentations, and participation points ***equal 700 points for both undergraduate and graduate students enrolled in the lab.*** No labs can be dropped, there will be no extra credit assignments, and the lab grades will not be curved; however, ***10 bonus points will be awarded if at least 75% of registered students complete the lab SPOT evaluations before the deadline (details below).***

Grade Scale:

Undergraduate Students (4261)			Graduate Students (5261)	
Points	**Grade**		**Points**	**Grade**
630 – 700	A		630 – 700	A
560 – 629	B		560 – 629	B
490 – 559	C		490 – 559	C
420 – 489	D		420 – 489	D
< 420	F		< 420	F

Attendance and Participation:
Attending labs and being on time are your responsibilities. If you miss a lab, you will get a zero for the day. Reasonable accommodation may be offered in actual cases of adversity (e.g., illness, death in family), but you will have to prove your case to my satisfaction. Try to get to class on time. While there will be no extra credit given for this class, your feedback is very important to the improvement of the lab. Therefore, we will offer 10 bonus points to all students ***if at least 75% of the registered students complete the SPOT evaluations for the lab before the deadline.***

Make-Up Labs:
Due to the fact that these labs are done in-person using software installed in the GAB 550A computers, ***there will be no make-up labs***; however, if you have a verifiable, accepted excuse (e.g., illness, COVID-19, a death in the family) with a written note from a doctor or other professional, then we will allow you to drop a lab and your score will be calculated out of 40 less points (i.e., your final score will not include the lab you were excused to miss).

Incomplete (I) Grade:
Do not ask for an "Incomplete" grade unless you have a MAJOR life event that does not allow you to attend class. I will only give an incomplete grade under extraordinary circumstances. Please refer to the UNT policy regarding incomplete grades.

AI, Plagiarism, and Academic Integrity:
The unauthorized use of any person or technology that assists in a student's assignment, project, or paper is considered cheating under the UNT Student Academic Integrity Policy (UNT Policy

6.003). In this class, AI cannot be used to complete assignments, projects, papers, or lab reports. Doing so will result in a cheating violation. AI should not be used to assist in writing papers, searching for sources, or creating citations. Citations provided by AI are often fabricated by mimicking existing bodies of work. In many cases, AI will pull direct quotes from existing sources to answer queries and make up information about the source. AI can be used ethically to help you develop an outline for a paper, generate ideas, and learn a citation style. Talk to your professor or TA about how you can use AI ethically.

Plagiarism is the act of using someone else's words, ideas, or work without proper acknowledgment, whether by copying directly, paraphrasing too closely, or failing to cite sources appropriately. Plagiarism includes, but is not limited to, the following: the knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgment, and the knowing or negligent unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. In academic writing, plagiarism undermines the values of honesty, fairness, and responsibility that form the foundation of academic integrity. Because scholarship depends on the clear and accurate communication of original ideas, passing off another person's work as your own violates the trust between students, instructors, and the academic community. To maintain integrity in this class, all submitted writing must reflect your own understanding and properly credit any sources that inform your work.

Students caught cheating or plagiarizing will receive a "0" for that particular assignment or exam. This includes using AI to write your lab reports. ***The instructor and TA will use AI detection tools to evaluate your work and determine if it was generated from a human or AI.*** If a student is caught cheating in any way, the incident will be reported to the Dean of Students, who may impose further penalty. According UNT's catalog, the term "cheating" includes, but is not limited to: a.) use of any unauthorized assistance in taking quizzes, tests, or examinations; b.) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; c.) acquisition, without permission, of tests or other academic material belonging to a faculty or staff member of the university; d.) dual submission of a paper or project, or resubmission of a paper or project to a different class without express permission from the instructor(s); or e.) any other act designed to give a student an unfair advantage. See UNT's Academic Integrity Policy (PDF) (https://policy.unt.edu/sites/default/files/06.049_Standard%20Syllabus%20Policy%20Statements_supplement.pdf) for more information.

Disabilities Accommodation:
The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will

provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (http://www.unt.edu/oda). You may also contact ODA by phone at (940) 565-4323.

General Lab Rules:
All labs will take place in GAB 330D, which is a computer lab on the third floor of the General Academic Building. Your conduct in this class should conform to the UNT Code of Student Conduct (www.dos.unt.edu/conduct). That being said, we want to encourage a dialogue in this class and nothing stifles dialogue as quickly as disrespect for someone's opinion or level of knowledge. I expect you to ***treat your fellow classmates with respect*** while expressing your opinion. I want to encourage healthy discussion and even dissent, but disrespect for your fellow students in class discussions is unacceptable.

Acceptable Student Behavior:
Student behavior that interferes with an instructor's ability to conduct a lab or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The university's expectations for student conduct apply to all instructional forums, including university and electronic classrooms, labs, discussion groups, field trips, etc. See https://deanofstudents.unt.edu/conduct for more information. Emergency Procedures and Notifications: Students will be notified by Eagle Alert if there is a campus closing that will impact a class; consequently, the calendar is subject to change. I will also update all students of changes via the course Canvas page. For more information, please refer to the Emergency Notifications and Procedures Policy (PDF) (https://policy.unt.edu/sites/default/files/06.049_Standard%20Syllabus%20Policy%20Statements_supple ment.pdf).

Retention of Student Records:
Student records pertaining to this course are maintained in a secure location by the instructor. All records, such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion.

Coursework completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment. You have a right to view your individual record; however, information about your records will not be divulged to other individuals without proper written consent. You are encouraged to review the Public Information Policy and F.E.R.P.A. (Family Educational Rights and Privacy Act) laws, as well as the university's policy in accordance with those mandates (see: https://registrar.unt.edu/faculty/ferpa-andstudent-records).

Schedule:
Following is a ***tentative*** schedule for the lab. This may be subject to change depending on availability of materials or other conditions. Labs will use the open-source R programming language, which will be deployed by the Posit software, R Studio; these software packages are free to download and will be available on the computers in GAB 330D. All labs need to be attended in person.

Indicated for each week are the date, the topic we will cover, any assignments that are due, and the points associated with each assignment.

Date	**Topic**	**Assignment**	**Points**
August 18	Introduction to R and R Studio for studying Evolution; Darwinian Natural Selection	Introduction to R and Darwinian Natural Selection R Tutorial and post-lab questions	Completed Introduction to R and Darwinian Natural Selection R Notebook (40) and post-lab questions (10)
August 25	Phylogenetic Reconstruction	Phylogenetic Reconstruction R Tutorial and post-lab questions	Completed Phylogenetic Reconstruction R Notebook (40) and post-lab questions (10)
September 1	Mechanisms of Evolution I: Modeling the Effects of Natural Selection	Mechanisms of Evolution I R Tutorial and post-lab questions	Completed Mechanisms of Evolution I R Notebook (40) and post-lab questions (10)
September 8	Mechanisms of Evolution II: Modeling the Effects of Genetic Drift, Migration, and Mutation	Mechanisms of Evolution II R Tutorial and post-lab questions	Completed Mechanisms of Evolution II R Notebook (40) and post-lab questions (10)
September 15	Molecular Evolution	Molecular Evolution R Tutorial and post-lab questions	Completed Molecular Evolution R Tutorial (40) and post-lab questions (10)

September 22	Quantitative Genetics	Quantitative Genetics R Tutorial and post-lab questions	Completed Quantitative Genetics R Notebook (40) and post-lab questions (10)
September 29	Mutation, Genetic Variation and Adaptation	**Article Discussion** Group Paper Presentations	Article Discussion Presentations (40 points for paper presentation and 10 for participation).
October 6	Adaptation	Adaptation R Tutorial and post-lab questions	Completed Adaptation R Notebook (40) and post-lab questions (10)
October 13	Sexual Selection	Sexual Selection R Tutorial and post-lab questions	Completed Sexual Selection R Notebook (40) and post-lab questions (10)
October 20	Evolution of Social Behavior	**Article Discussion** Group Paper Presentations	Article Discussion Presentations (40 points for paper presentation and 10 for participation).
October 27	Group Project Brainstorming	**Group Work** Work with your group to come up with an idea for your data analysis project.	No assignment (0); use class time to work on group projects.
November 3	Speciation	Speciation R Tutorial and post-lab questions	Completed Speciation R Notebook (40) and post-lab questions (10)
November 10	Coevolution and Evolving Diseases	Coevolution and Evolving Diseases R Tutorial	Completed Coevolution and Disease R Notebook (40) and post-lab questions (10)
November 17	Group data analysis proposals.	**Group Work** Present group project proposals to instructors and obtain feedback.	No assignment (0); use class time to work on group projects.
November 24	**THANKSGIVING BREAK (No class.)**	No assignment.	No assignment (0).
December 1	Group Data Analysis Projects	Group presentations.	Group Presentation (80) and participation in other

			presentation discussions (20)
December 1	Review Paper Data Analysis Project	Analysis for Review Paper (***Graduate students only!***)	Individual Presentation for Review Paper (80) and participation in other presentation discussions (20).
		TOTAL	**Undergrad (700)** **Grad (700)**

*****This schedule is tentative and subject to change when necessary.*