

GENETICS 4230L: EVOLUTIONARY BIOLOGY LABORATORY
Spring 2013, 4 credits

Class meetings:

Tuesdays 8 am -12:15 pm and Thursdays 9:30 am – 12:15 pm. Life Sciences C104.

Instructors and their contact information:

Dr. Kelly Dyer

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Office hours: by appointment (please email)

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Ms. Elizabeth (Liza) Lucht, Teaching assistant

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Ms. Carmen Rodriguez, Lab manager

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Course Description: In this class we will explore how evolution operates (via the processes of mutation, selection, gene flow, and drift) and the consequences of evolution in action (via the study of adaptation and speciation). We will combine wet lab and analytical activities to expose you to a variety of methods and questions in modern evolutionary genetics.

Prerequisites: You should have already taken GENE 3000 (Intro to Evolution); this course may also be taken as corequisite with instructor permission. You will also need to have a firm grasp of Mendelian genetics and the basics of macromolecular structure and biochemistry involved in genetics. Basic algebra and statistics will be required.

Textbook: Lab handouts and papers for discussion will be distributed via eLC. There is no required textbook for this course; however, we suggest you keep an evolutionary biology textbook handy as a reference. We strongly recommend the following book as a resource for analyses, lab write-ups, and presentations: A Student Handbook for Writing in Biology, 3rd Edition. 2009. By Karin Knisely.

Grading: your overall grade in this class will be based on the following distribution:

Attendance and participation, 3 points per class. These are ‘good citizen’ points.

Unexcused absence, late arrival, and disruptive behavior will be counted against you.

Quizzes, 10 points each, to be completed at the beginning of some classes, and generally unannounced. Material will be based on reading necessary to participate in lab that day.

Lab notebook, 20 points each assessment. In a single bound notebook you will need to take very careful notes of what you do during each experiment. You will want to write your objectives, experimental plan, observations, data, and preliminary calculations. It should be neat and organized enough that someone can read it, and, even better, follow along to repeat your experiment. If you do a good job keeping your lab notebook, it will often have diagrams, drawings, and so on to identify key steps in the process of an experiment. Periodically, we will have you turn in a photocopy of the most recent lab or two from your lab notebook, and those will be graded for their ability to convey what you did, and allow

somebody else to repeat that process. See the figure below for an example of a thorough lab notebook.

Short Assignments, 20-50 points each. Not all labs will have write-ups, and in some cases you will turn in shorter assignments rather than a full report.

Lab reports, 100 points each. See the description below for details. A rubric with the point breakdown will be handed out and discussed in class.

The final number of points may vary, though you can expect around 1000 points total for the course. Late assignments will be docked 10% per day unless a prior arrangement has been made with an instructor. A “B” is considered the average grade in this class, with the approximate grade distribution following the quartiles: A is 92.5 or above, A- is 90-92.49, B+ is 87.5-89.99, B is 82.5-87.49, B- is 80-82.49, and so on. If necessary we will curve to class advantage. No makeup points will be given; if you have legitimate excused absences with documentation, your grade will be based on the remaining scores.

Electronics: Please turn your phone off during class and office hours.

Religious Holidays: If you plan to miss a class because of a religious holiday, you must talk to one of the instructors at least fourteen days prior to the class to make arrangements to make-up missed work.

Honor Code: All students will abide by the UGA Student Honor Code: "I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others." All suspected incidences of academic dishonesty, as outlined under prohibited conduct in the UGA academic honesty policy (<http://www.uga.edu/ovpi/honesty/sect05.htm>), will be treated following UGA guidelines (http://www.uga.edu/ovpi/honesty/culture_honesty.htm). You will be working closely with partners in this lab, but your work must be your own, reflect your own thought, show your own math and reasoning, and so forth.

Disclaimer: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Acknowledgments: Credit is due to the many colleagues who provided ideas and imagery for this lab manual. Wherever appropriate, we have tried to provide reference information throughout the text, which is an annual work in progress; your help in notifying us of errors, missing information or references, or ways in which it could be improved are greatly appreciated. **This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 2.5 License.** To view a copy of this license visit creativecommons.org. This license represents our intention to provide the manual to colleagues for free, and ask that those who use this manual respect the license noted above.

Lab reports: Your lab reports will follow the format of a scientific paper, for example from the journal *Evolution*.

Title: Your own title that succinctly describes your study.

Abstract: The abstract is a self-contained description of the paper that is one paragraph in length. It must make sense when read on its own. Include the motivation for the study (why do we care?), the hypothesis you are testing, the general approach, a summary of the results, and the general conclusions.

Introduction: In your own words, discuss the central aim of this experiment and why you did it. Use scientific sources to provide context for your experiment and explain the relevant scientific principles. Be explicit about the goals of your study and/or the hypotheses you are testing.

Methods: Explain the methods you used. Use your own words, and do not verbatim repeat the lab manual. This should be in paragraph, not list, format. Use past tense, and provide enough detail to enable the reader to repeat the experiment. Assume your reader has some knowledge of laboratory practices and do not explain routine procedures.

Results: Summarize your data and the trends in your data in paragraph format. Do not give possible explanations for the results. Only write out the unusual or difficult calculations. Present your data either in graph or in tabular form. Refer to each table and figure by number in parentheses at the end of the first sentence in which you describe that visual.

Discussion: Discuss what your data mean and whether your hypothesis is supported. Present the evidence for your conclusions. Discuss any errors in the execution of the experimental protocol or weaknesses of the experiment. Address any questions that were posed at the end of the laboratory. Show how your results relate to findings published in the primary literature. Suggest further experiments that you think are relevant.

References: All references must be cited appropriately, with the full citation listed here. List only the sources you have cited in the body of your lab report. The reader assumes that if you cite something, you have read it. Generally, you will only want to use scholarly sources. In the sciences, we generally do not quote directly from a source, but rather summarize it in your own words and include a citation with the reference. Reference format should be as in the journal *Evolution*: Name, X.Y. Year. Title. *Journal* ##:pages. Example: Wares, J.P. 2001. Comparative phylogeography of the North Atlantic. *Evolution* 51: 1999-2011.

Figures and Tables. You may place figures and tables either at the end of the paper or in line in the text near where they are first mentioned. Make sure they are clearly organized, with the axes labeled. Do not include both a table and a figure for the same data. For each table or figure, include a caption that consists of a number and a short description that enables the reader to understand the visual without having to refer to the body of the Results section.

Your lab reports will be scored for clarity, content, and style. Please write in the active voice, and be succinct. Please use 12 pt. font, double-spaced, with 1 inch margins. Lab reports are to be original and individual efforts. You should feel free to discuss your data and questions with the instructors and your classmates, but the writing must be your own. If you find writing to be especially challenging, we recommend the Writing Center (<http://writingcenter.english.uga.edu/>).

GENE 4230L: Tentative course schedule.

Class	Date		Tentative topic	
1	T 1/8	KD	Luria-Delbrück I	
2	R 1/10	KD	Luria-Delbrück II	
3	T 1/15	KD	Luria-Delbrück III	
4	R 1/17	KD	Luria-Delbrück IV	
5	T 1/22	KD	Luria-Delbrück V	
6	R 1/24	KD	Identifying Mutations I	
7	T 1/29	KD	Identifying Mutations II	L-D rough draft
8	R 1/31	KD	Identifying Mutations III	
9	T 2/5	KD	Identifying Mutations IV	L-D report due
10	R 2/7	KD	Identifying Mutations V	
11	T 2/12	KD	Fitness of Mutations I	Mutation rough draft
12	R 2/14	KD	Fitness of Mutations II	
13	T 2/19	KD	Fitness of Mutations III	Mutation report due
14	R 2/21	KD	Fitness of Mutations IV	
15	T 2/26	KD	Phylogenetics I	Fitness rough draft
16	R 2/28	AS	Phylogenetics II	
17	T 3/5	AS	Phylogenetics III	Fitness report due
18	R 3/7	AS	Phylogenetics IV	
	T 3/12		No class: Spring break	
	R 3/15		No class: Spring break	
19	T 3/19	AS	Population genetics I	
20	R 3/21	AS	Population genetics II	
21	T 3/26	AS	Population genetics III	
22	R 3/28	AS	Genomic technologies	Pop Gen rough draft
23	T 4/2	AS	Quantitative genetics I	
24	R 4/4	AS	Quantitative genetics II	Pop Gen report due
25	T 4/9	AS	Quantitative genetics III	
26	R 4/11	AS	Quantitative genetics IV	
27	T 4/16	AS	Quantitative genetics V	
28	R 4/18	AS	Speciation I	Quant Gen rough draft
29	T 4/23	AS	Speciation II	
30	R 4/25	AS	Poster session	Quant Gen report due
			(final exam time)	

Add a point value for the rough draft? (discuss)- add any WIP relevant stuff

Rubric for lab reports: Breakdown of 100 points

Abstract:

Clear, concise, and stands alone 10

Introduction:

Relevant background and broader context 10

Goals/hypothesis clearly stated 5

Methods:

Explained well and with appropriate level of detail 10

Results:

Data summarized and trends noted 10

Figures, tables, graphs used appropriately 5

Figures and tables clear and formatted appropriately 5

Discussion:

Results fully interpreted 10

Conclusions placed context of other work and/or theory 10

References:

Appropriate formatting 5

Scholarly sources used and accurately documented 5

Mechanics:

Spelling and syntax correct 5

Paper well organized and easy to follow 5

Information in appropriate section 5