

Course Syllabus

BISC 579 Neural Genetics

Instructor: Dr. Gregg Roman

groman@olemiss.edu

Office Location: Shoemaker Room 214

Office Hours: By Appointment

Semester: Spring 2017

Lecture: Shoemaker room 405

Lecture times: Tuesdays 4-5:50 pm

Course Description: The Neural Genetics course provides students with the skills and knowledge required to understand scientific papers in the field of neural genetics. We will read and analyze several papers that report transgenic techniques for manipulating neural activity to understand the role of specific neural circuits in behavior. Early in the course, we will closely read some classic papers to develop critical reading skills. Later we will focus on papers that use *Drosophila* and mouse model systems. The course will include some lectures, but a majority of the classes will be group discussions of scientific papers.

Learning Objectives: After completing this course, students will know several mechanisms for identifying neural circuits and interrogating these circuits for function in behavior. Students will understand the utility and limitations of genetic approaches in the dissections of behavior and neural functions. Students will further have an in-depth understanding of the basic principles and techniques underlying thermo-, chemo-, and optogenetics. Students will be able to evaluate a journal article in neural genetics critically. The critically reading skill will include identifying claims made by the authors and determining if the included experiments support those claims. Students will also develop skills to present scientific literature orally.

Textbook: None – papers and material will be made available on Blackboard.

Attendance: The students are responsible for participation in all classes. Attendance is required and will be counted toward the course grade. An absence can be made up by writing a two-page analysis of the paper presented during the missed class.

Grades: Students will participate in group discussions and will twice act as discussion leaders. For each paper to be discussed, each student must read the paper prior to the discussion and submit one thoughtful scientific question at the start of class. This question may address a technical question regarding the experimental approach, or a conceptual question regarding the validity of the conclusions. An undergraduate student's grade will be determined from their performance as a discussion leader (50%), their participation in class discussions (25%), the quality of their written questions (25%). A graduate student's grade will be determined from their performance as a discussion leader (40%), their participation in class discussions (20%), the quality of their written questions (20%), and the quality of their paper review (20%).

Scale: A = 93-100%; A- = 90-92%; B+ = 87-89%; B = 83-86%; B- = 80-82%; C+ = 77-79%; C = 73-76%; C- = 70-72%; D+ = 67-69%; D = 63-66%; D- = 60-62%; F = 59% or less. This scale is non-negotiable.

Class Schedule:

Date	Topic	Behavior	Paper	Discussion Leader
1/21	Intro-Organization	Brief Lecture	No paper	Roman
1/28	Critical Reading	Memory	Ungar, 1968, 1972	Roman
2/4	Genetic Approach	Lecture	No Paper	Roman
2/11	Neural Anatomy	MARCAM/ Mosiacs	Lee and Luo, 1999	TBD
2/18	Defining synaptic connections	Dynamic Circuits X-GRASP	Mcpherson, 2015	TBD
2/25	Genetically encoded sensors	Neurophys	Sun, et al. 2018	TBD
3/3	Neural Inhibition dORK	Circadian Rhythms	Nitabach, et al. 2002	TBD
3/17	Neural Activation NacBac	Circadian Rhythms	Nitabach, et al. 2006	TBD
3/24	DREADD – neural modulation	Diurnal and Learning	Becnel, et al. 2013	TBD
3/31	Thermogenetic Inhibition shibire	Olfactory Memory	Dubnau, et al. 1999 McGuire, et al. 2000	TBD
4/7	Thermogenetic Activation TrpA1	Taste Memory	Keene and Masek, 2012	TBD
4/14	Optogenetic	Mouse Fear Memory	Liu, et al. 2012	TBD
4/21	Optogenetic	Creating a False Memory	Ramerez, et al. 2013	TBD
4/28	CRISPR	Gene Regulation	Savell, et al. 2019	TBD

Each week, students will either act as a Reader or a Discussion Leader

Readers: Each week, the readers will read the assigned paper prior to class and write out one substantive question regarding the work. This question should be about the contents of the paper and address questions of experiment or interpretation. The question will preferably come from data presented in the figures or described in the Results section, or they may come from a specific issue with the Methods, or they may address a particular conclusion drawn in the Discussion. The purpose of writing this question is to help you think more deeply about the paper so that you can initiate and participate in a critical discussion of the paper during class. The goal is to have a class that is ready to dig deep into the experiment and how best to interpret them. We are also interested in discussing how to evaluate a paper as a reviewer.

Discussion Leader: Each leader is responsible for a close and critical reading of the paper. You should be able to clearly explain and discuss all experiments within the paper, and present this to your audience in a logical manner. The presenter needs to meet the instructor at least a

few days prior to their presentation to discuss the paper and their presentation. It is the responsibility of the presenter to make this appointment.

The presenter should be prepared with slides to help lead the class through the paper. This presentation will include at least some background information to support the primary experimental questions addressed, followed by slides that explain what was done and what it meant. A rationale for the author's approach should be clearly articulated. It is also completely appropriate for the presenter to pose questions to the class to initiate discussion. The presenter is should also be critical and mention the limitations of the experiments and interpretations of the data. When appropriate, the presenter can mention the next set of experiments or outstanding questions raised by the paper.

Written Paper Review: Graduate Students in this course are expected to identify a paper that uses a neural genetic approach to dissect the function of a neural circuit in a behavior. This paper is not to be one that we discussed in class. The students are responsible for critically reading this paper and providing a scientific review. This review will include:

1. A summary of the main findings with a statement of their importance and likely or known impact. (1-2 paragraphs).
2. A description of the approaches used and their validity. This section should highlight strengths and identify weaknesses & caveats. A comment on the appropriateness of the methodology and analysis is required in this section.
3. A comment on the clarity and organization of the paper.

The purpose of this exercise is to develop skills in manuscript review. Overall, this paper review should be less than three pages, single-spaced, 11 pt. font. This paper is due on the last day of class, **April 28th, 2020**.

Academic Integrity: Students are expected to abide by the University's policies on academic honesty and conduct:

<https://secure4.olemiss.edu/umpolicyopen/ShowDetails.jsp?istatPara=1&policyObjidPara=10817696>. Failure to abide by these policies will result in actions that may include course failure, or even suspension from the University.

Disability Access and Inclusion: The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of noncaptioned or non-transcribed video and audio files. If you are approved through SDS, you must log in to your Rebel Access portal at <https://sds.olemiss.edu> to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at 662-915-7128 so the office can: 1. determine your eligibility for accommodations, 2. disseminate to your instructors a Faculty Notification Letter, 3. facilitate the removal of barriers, and 4. ensure you have equal access to the same opportunities for success that are available to all students.