



NEUR 405 – Animal Behavior Spring 2023 (3 credits)



Instructor: Dr. Ren Guerriero (they/them)

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Meeting times: Friday, 10:30 am - 1:10 pm EST

Meeting location: Krasnow Classroom, Krasnow 259

Office Hours: Wednesday 11:00 am - 12:00 pm EST and by appointment

Office Location: Krasnow 253 and [Zoom](#)

What is this class?

This class will get you in the lab and start with your own independent research project. Working in groups, students will investigate novel sleep-related genes in the fruit fly, *Drosophila melanogaster*. This will include weekly class meetings to learn new lab techniques and discuss literature, and also out-of-class research time to work with flies and gather new data. The class will culminate with a poster presentation describing your new findings.

What will I get out of this class?

Learning Outcomes:

- (1) Design a research project from experimental design, data collection, and analysis to investigate your gene of interest.
- (2) Care for *Drosophila* and set up crosses for genetic manipulation.
- (3) Gain a behavioral and genetic understanding of sleep and circadian rhythms.
- (4) Learn to analyze a variety of *Drosophila* behaviors (sleep, activity, climbing).
- (5) Communicate data and conclusions in a research poster.
- (6) Transfer techniques learned to other organisms and research projects.

How do I do well in this class?

This class requires you to be responsible for your own research project investigating a newly identified sleep-related gene. You will start with generating a hypothesis, gather data, run the statistics, and communicate your findings. You will work with your classmates in small groups to divide the workload. This will require a lot of time coming into the lab to maintain stocks, set up

crosses, and run sleep experiments. Assigned readings are given to help you learn fly care and important background information, and homework is all designed to help you produce.

To do well you need to do your readings before coming to class and be ready to discuss. I recommend taking notes in your lab notebook when reading and coming prepared for discussion. Also, communication is key to doing well in this course. You will be graded on your written and oral communication, but communication is necessary when you are confused in class.

To make sure we all know how to act in class, our first day we will write and vote on a code of conduct, which will then be added to the syllabus. This will include both instructor and student responsibilities. It is then our job to uphold ourselves and others to the code of conduct.

What materials do I need for this class?

Each student will keep notes and compile data in their very own lab notebook. This is a tool that you will always use in research. Before class on week 2, you need to bring a lab notebook; this notebook needs to have ruled pages (grid is okay) that cannot be easily removed from the book (book bound, not spiral bound OR the pages are already numbered). This can be a simple composition notebook (~\$1 at [Walmart](#)) to more fancy notebooks with carbon copies (~\$19 at [GMU Bookstore](#)). You will need to write in this notebook using PEN (not pencil) and on only one side of the page. Reserve the first 2 pages for the table of contents.

What are our responsibilities? (Code of Conduct)

These will be written and voted on in our first meeting of the class.

Student responsibilities:

Instructor responsibilities:

- COVID Policies: All students, instructors, and TAs are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>). Similarly, all students, instructors, and TAs in face-to-face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system and students will receive either a Green, Yellow, or Red email response. Only students, instructors, and TAs who receive a "green" notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.
- All class members are required to follow Mason's current policy about facemask-wearing. As of August 11, 2021, all community members are required to wear a facemask in all indoor settings, including classrooms. An appropriate facemask must cover your nose and mouth at all times in our classroom.

How will I be graded in this class?

Grading Scale:

A+ 97-100%	B+ 87-89%	C+ 77-79%	D 60-69%	F	0-59%
A 93-96%	B 83-86%	C 73-76%			
A- 90-92%	B- 80-82%	C- 70-72%			

Assignments (90 points, 9 x 10 points) – Every week, after completing your reading, there will be a worksheet to do. This will help you understand the main points of the readings and identify things that you do not know. Some weeks, instead, you will have a 2 sentence summary. One sentence will be something new and interesting that you read, and another sentence on something that you have a question about. Other weeks you will be assigned worksheets about your specific gene or readings.

Participation (70 points, 14 x 5 points/day) – Attending class is essential for this research-based course. You will learn new techniques that will be used that week with your flies and you will go over reading and other assignments. Participation also includes coming to your agreed upon lab times outside of our class meeting. This is when you will collect data and be working with your flies. Not coming to class or to work in the lab will put your research project behind and you will not have a completed project for your poster showcase.

Lab Notebook (40 points) - Everything that you do for your research project needs to be written down in your lab notebook. (See above for notebook specifications) This is a complete log of your work on the project that can be read by future researchers working on this project. Your notes must be neat and able to be read by others (this includes defining all your abbreviations). Notebooks must be filled out in pen (to prevent erasing of data) and any mistakes should just have a single line to cross them out. Further instructions will be given during the first class meeting.

Poster Presentation (100 points) – At the end of the semester, each group will present a poster on their findings. This will include an abstract, introduction, methods, results, conclusions, and future work. To make this poster, data will be statistically analyzed and conclusions will be drawn from the data you collected.

I missed class or an assignment, what do I do?

Life is unpredictable and illness (both physical and mental) should be taken seriously. If you know you will not be in class, email Dr. Guerriero. Holidays, illnesses, and university sanctioned events likely count as an excused absence, but only if you notify Dr. Guerriero either before the event or as soon as you decide you're too ill to come to class. If you miss your out of class lab time, you MUST NOTIFY YOUR GROUP MEMBERS and get them to cover your work.

I'm struggling in this class. How do I get help?

I don't understand the class material, assignments, my grades – email Dr. Guerriero. When emailing us, you have to use your gmu.edu email account or we cannot verify that the email came directly from you.

I'm stressed, anxious, angry, or mentally unwell – [Counseling and Psychological Services](#) have drop-in hours or virtual services, including a text line, online chat, and video chats. If its outside business hours, they have an after-hours crisis counselor (call 703-993-2380 and selection option 1).

I need help with time management, note taking, or other study skills – Talk to Dr. Guerriero or reach out to [Learning Services](#) for a personalized appointment and online tools.

I'm struggling with social issues that impact my identity, my culture, or me personally – College and higher education is inherently exclusionary, racist, sexist, and classist, and I'm committed to helping change that. Mason is also committed to this, with lots of resources:

[Center for Culture, Equity, and Empowerment](#) (includes bias incident reporting form)

[First-Gen+ Center](#) (resources for first-generation, undocumented, refugee, and limited income students)

[LGBTQ+ Resources Center](#) (including crisis, community, and gender transition resources)

[Student Support and Advocacy Center](#) (resources for financial help, sexual and interpersonal violence support, and drug/eating disorder recovery)

I need class accommodations for a disability, illness, or other reason – First talk to [Disability Services](#) office. They will meet with you virtually and help you with your individual needs. We can only activate your accommodations after you talk with Disability Services. Then talk to Dr. Guerriero about this class; they are happy to help you with what you need.

Tentative Schedule – Spring 2023

Subject to change (check Blackboard for the most recent version)

Assumptions: Meeting once a week on Friday for lab meeting

Students work outside the lab on their own projects

Week	Class Content	Lab Techniques	Homework Due Before Class
1	Online - Lab Safety	Biological research safety	<u>Reading</u> : Syllabus, Blackboard <u>Assignment</u> : Lab Safety training
2	Introduction to <i>Drosophila</i> Introduction to the project Code of Conduct	Lab Notebooks Sex determination Introduction to DAM2 Monitors	<u>Reading</u> : <i>Drosophila Workers</i> Unite – Ch 1 and 2 <u>Assignment</u> : Ch 1/2 worksheet
3	Reading Fly Genotypes, Measuring activity and sleep in flies	Virgin determination, commonly used genetic markers (curly, stubble, tubby) Setting up crosses	<u>Reading</u> : <i>Drosophila Workers</i> Unite – Ch 3 and 4 <u>Assignment</u> : Ch 3/4 worksheet
4	Genetics refresher, Homolog search using mouse genes to find fly genes	Loading control flies in sleep monitors, FlyBase gene search, BLAST	<u>Reading</u> : <i>Drosophila Workers</i> Unite – Ch 5 and 6 <u>Assignment</u> : Ch 5/6 worksheet
5	IMPC introduction Designing research hypotheses	Load progeny in monitors, Our genetic mutants, GAL4-UAS system	<u>Reading</u> : <i>Drosophila Workers</i> Unite – Ch 8 <u>Assignment</u> : Ch 8 worksheet
6	Manipulating genes in model organisms (GAL4-UAS, Cre-lox, CRISPR)	Gather Data, Load flies as needed, Introduction to IMPC database	<u>Reading</u> : Kayser and Biron, 2016. Sleep and Development in Genetically Tractable Model Organisms <u>Assignment</u> : Kayser and Biron 2016 Worksheet
7	What is sleep and what don't we know about it?	Load flies as needed, Mouse phenotypes of homolog knockouts	<u>Reading</u> : Shaw <i>et al.</i> , 2000. Correlates of Sleep and Waking in <i>Drosophila</i> <i>melanogaster</i> (abbreviated) <u>Assignment</u> : 2 sentence summary
8	SPRING BREAK		
9	Sleep and wake in flies (neuroanatomy) Limitations to the DAM2 monitors	Load flies as needed, Climbing assays	<u>Reading</u> : Flybase/ NCBI Gene for what is already known about your gene <u>Assignment</u> : FlyBase worksheet for your gene
10	New poster design Designing statistical hypotheses	Load flies as needed, What makes a good poster?	<u>Reading</u> : Joshi <i>et al.</i> , 2019. Noninvasive sleep monitoring in large-scale screening of

		Climbing assays	knock-out mice reveals novel sleep-related genes (Part 1) <u>Assignment</u> : 2 sentence summary
11	Introduction to Data analysis	Climbing assays Work on poster abstracts	<u>Reading</u> : Background on your gene from PubMed <u>Assignment</u> : Introduction for poster
12	Statistical analysis of activity and sleep data, Written scientific communication	Analyze data, Statistics	<u>Reading</u> : Joshi <i>et al.</i> , 2019. Noninvasive sleep monitoring in large-scale screening of knock-out mice reveals novel sleep-related genes (Part 2) <u>Assignment</u> : Finish abstract for poster
13	Building conclusions and putting our findings in perspective	Work on poster	<u>Reading</u> : none <u>Assignment</u> : Poster rough draft due
14	What does our data mean? Expanding our findings to mammals and human	Finish poster	<u>Reading</u> : none <u>Assignment</u> : Final poster version
15	Oral scientific communication		<u>Reading</u> : none <u>Assignment</u> : Practice poster talk
16	Practice talks for research showcase		<u>Reading</u> : none <u>Assignment</u> : Research Showcase