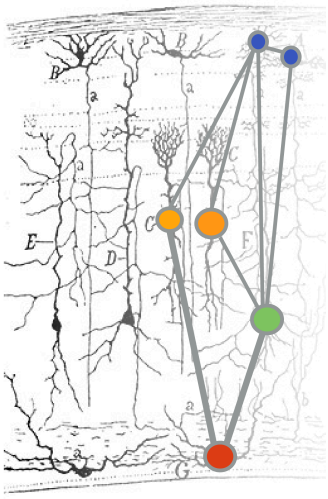

BIPN 145 Neurobiology Laboratory

Winter 2024

Instructor
Marc Marino, PhD
mjmarino@ucsd.edu
m2marino@ucsd.edu

Instructional Assistants
Nandita Rangu (nrangu@ucsd.edu)
Luiza Gaudio (lgaudio@ucsd.edu)

(Hybrid) Office hours
Vote on the incoming survey!
H&SS 1145I or on Zoom:
(https://ucsd.zoom.us/j/6858999405)

Staff Research Associate
Haley Stott (hstott@ucsd.edu)

Lecture: B00 (A01+A02) MWF 1-1:50 PM (PODEMOS 1A19)
Lab: B01 9:30 AM-12:50 PM (York Hall 1310)
B02 2:00-5:20 PM (York Hall 1310)

Course website: On Canvas and **Course google Drive**: Google Drive

Course learning objectives:

- **Collect** and **evaluate** neural data from various organisms
- **Apply** principles of neural communication to multiple model systems
- **Describe** the breadth of techniques in neuroscience and the experimental questions they are suited to answer
- **Build** an appreciation for and practical insight into the process of research
- **Develop** critical thinking and problem solving in the context of difficult neuro-biological experimentation
- **Communicate** research to peers as well as a broader audience

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Attendance Policies

Labs: In-person lab sessions are mandatory attendance. If you cannot attend a lab session due to a positive COVID-19 test, confirmed exposure, or for any other valid reason (sickness/emergency), **please contact BOTH the instructor and IAs** ASAP (prior to lab time) so that we can work with you on accommodations. **You will be expected to make up any lab sessions you miss.** If you suspect you have been exposed to a respiratory virus I encourage you to mask. If you have active symptoms consistent with COVID-19 or another respiratory virus: stay home, contact your IA and instructor, and get tested. If you do not have a valid excuse for missing the lab or do not contact the instructor, you will be marked as unexcused absent and lose points on any assignments related to

that particular lab day. Anyone with three or more **unexcused** absences will be at risk of automatically failing the class.
Lecture: Lecture sessions will be held in person and podcasted/recorded, but you will be expected to make up any in person activities that you missed. Lectures are not mandatory, but are encouraged as they will provide background information and practical insights into the lab techniques. You do not need to inform us if you will be missing a lecture session. Lecture sessions will not be unidirectional — these will be active learning sessions where we co-create our learning.
Enrolled and waitlisted students must attend the first lab session (on Tuesday, January 9th).
Additional details: http://biology.ucsd.edu/go/ug-labs.

Grading

Earthworm Report (150 pts, *25-100 pts each*)

- Data collected as a group, **written individually.** Your first lab report will summarize our earthworm experiments. This grade includes a draft (25 pts) and your review of two other drafts (25 pts), along with your final report (100 pts).

Assignments and Quizzes (370 pts, 10-50 pts each)

- Includes smaller lab write-ups, pre-lab quizzes, lab practicals

Final group project (250 pts)

- Project proposal (50 pts), presentation (100 pts), and written report (100 pts).

Two midterms (200 pts, 100 pts each)

- Multiple Choice and short answer exams focused on lecture and lab material

Professionalism (30 pts)

- Safety, clean up, teamwork, attendance & lab decorum

Attendance Bonus Points (+20 Pts)

- Lecture Attendance and Participation using iClickers (optional), 1 point per lecture.

Problem Set Bonus Points (+10)

- Answer the bonus practice questions at the end of lecture for +2 Bonus points. They will be graded for effort/completion and not accuracy. If you earnestly attempt to answer all questions you will get full credit. No bonus points will be given for unanswered questions or answers that are not sincere attempts. 2-3 points per problem set.

Additional notes on grading

- For **individual assignments only,** you have a 3 day late bank that you may use over the course of the quarter to extend your deadlines without penalty.
- You can request a late bank **before the deadline** by filling out this form: Late Bank
- Lab reports, essays, and assignments **will lose -10%** for each day they are late without protection from the late bank or a pre-approved extension from the instructor.
- Final scores will be converted to letter grades, where A=90-100%, B=80-89.99%,C=70-79.99%, D=60-69.99%, and F=0-59.99%. For plus and minus grades,

A+ = 97-100, A = 93-96.99, A- = 90-92.99, B+ = 87-89.99, B = 83-86.99, B- = 80-82.99, and C+ = 77-79.99, C = 73-76.99, C- = 70-72.99. D and F grades have no + or - grades.

- Final scores are as you see them on Canvas, once all of your assignments are graded. There is **no rounding up** to the closest score.

Please note that add/drop deadlines are different for lab courses than lecture courses. Students who drop a Biology lab class after the end of the second class meeting will be assigned a "W". Additional details: http://biology.ucsd.edu/go/ug-labs.

Course Philosophy

A note on our course's environment

We'll be working together to create an equitable and inclusive environment of mutual respect, in which we all feel comfortable to share our moments of confusion, ask questions, and challenge our understanding. Everyone should be able to succeed in this course. If you do not feel that is the case please let me or an IA know.

To help accomplish this:

- I'll ask for your preferred name & pronouns on our incoming survey. If these change over the course of the quarter, please let me know.
- Please don't hesitate to come and talk with me if you feel like your performance in the class is being impacted by your experiences outside of class.
- I am constantly learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.
- As a team member, you should also strive to honor the diversity of your classmates.

On the equity & diversity of our course content

In an ideal world, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. In this class, we will make an effort to show the work of diverse scientists, but limits still exist on this diversity. I acknowledge that it is possible that there may be both overt and covert biases in the material due to the lens with which it was written, even though the material is primarily of a scientific nature. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. To this end, we will discuss diversity in neuroscience as part of the course from time to time.

Course accommodations

If you need accommodations for this course due to a disability, please contact the Office for Students with Disabilities (osd@ucsd.edu) for an Authorization for Accommodation letter. Please speak with me in the first week of class if you intend to apply for accommodations. For more information, visit http://disabilities.ucsd.edu. We will use the Triton Testing Center (TTC) for OSD tests, please make sure you are signed up on register blast and able to take your exams there.

This course, and the work it entails, is for *you*
So, you won't benefit if others do your work. Cases of academic dishonesty or cheating will be first handled by me, and then by the Academic Integrity Office. If you become aware of cheating in this class, you can anonymously report it: https://academicintegrity.ucsd.edu/

A brief note on ChatGPT and other AI language models: It is not acceptable to use AI to write lab reports or assignments for this class. All the words in your assignments need to be written by you. You can, however, use AI to assist you in brainstorming, outlining, and/or to address content questions. I would recommend against using it to find references as the AI tends to make up ("hallucinate") references and these will be checked by a TA, so you need to verify and read real references. Typically these AI models are not 100% trustworthy, and I would be extremely careful utilizing them without confirming from a trusted source the AI generated information.

Lab safety is important
Enrolled and waitlisted students must successfully complete the Biology Lab Safety Training and Assessment before the first lab session: https://biolabclass-safetyquiz.ucsd.edu/introduction. Please note that courses offered by other departments (Chemistry, for example) may have additional safety training requirements. If you arrive at the first lab session having not passed the safety assessment, you'll only be able to observe the lab. **You will *not* be allowed into the lab for the second in-person lab session unless you have successfully passed the safety assessment.**

In terms of safety equipment the only requirement is a basic dress code: long pants, closed toed shoes. The lab is BSL0 so **there is *no requirement* for lab coats, nor safety glasses/goggles, nor rubber gloves. Please do not bring your lab coat from your lab or another lab course.** We will provide nitrile gloves and clean lab coats when required.

Additional resources
There are many more resources listed here to help you succeed this quarter. If there is anything you think we can help you out with, please reach out to the IAs or the instructor.

Course management & texts

Canvas

This course will be using Canvas to manage content and grades. You can log in by going to http://canvas.ucsd.edu. It's recommended that you **avoid Safari** for Canvas quizzes and exams (Firefox or Chrome works great). If you need any technical assistance with Canvas, please alert your instructor and send an email to servicedesk@ucsd.edu.

Textbook

There is a Lab Manual (Bipn 145 Lab Manual (2022), ISBN: 9781533945556) that you can pick up at the UCSD Bookstore. You can purchase the BIPN 145 lab manual in the bookstore by searching for our course. Previous versions of the manual are fine. A hard copy of the manual is necessary: computers/ipads/phones will often produce electrical noise/interference in our experiments. There is no mandated textbook for this course, but most of the background material can be found in Purves et al. (2018) *Neuroscience*. We'll also use Carter & Shieh (2015) *Guide to Research Techniques in Neuroscience*, which can be found online here (link is also under *Resources* on Canvas). In addition, for each module I have curated resources that will be useful to you. You can find these on Canvas.

Software for this class

Since we'll often be relying on your personal computers (rather than our lab computers), there are also various programs you'll be asked to install and use throughout the quarter. If you have any issues with these or would prefer not to download anything onto your personal computer, you are welcome to rely on a teammate or reach out to us for additional accommodations. If you need a laptop for the quarter, you can request a loaner laptop by filling out this form: https://eforms.ucsd.edu/view.php?id=490887.

DataHub

We'll be using the UCSD DataHub for coding exercises and to run analysis code. Check your login at http://datahub.ucsd.edu.

Microsoft Office

It will be really useful to have Microsoft Office in this course. You can find it here.

LabChart Reader

If you can, please download LabChart Reader on your personal computer. We'll be using this to analyze previously collected data.

Course Schedule Subject to Change. (Due dates on Canvas)

Week 1

Jan 8	Lecture	PODEMOS 1A19	Introduction to BIPN 145 + Nervous systems	Take the Incoming Survey
Jan 9	Lab	York 1310	In lab Lecture Passive potentials + **Computer Lab #1:** Neuromembrane (Note: This experiment is not in your lab manual! It can be found here.)	**Due Prior to First Lab**: Lab Safety Quiz
Jan 10	Lecture	PODEMOS 1A19	Modeling Neural Activity	**DUE @ 11:59pm**: Neuromembrane Quiz
Jan 11	Lab	York 1310	**Experiment #1:** RC Circuits	(drop deadline for labs)
Jan 12	Lecture	PODEMOS 1A19	The action potential	**DUE @ 11:59 pm**: RC Circuit Quiz & **READ**: Hodgkin & Huxley 1939

Week 2

Jan 15			*No Class (MLK Jr. Day)*	
Jan 16	Lab	York 1310	In Lab Lecture: Recording from the nervous system + **Experiment #2:** String Lab	**DUE in Lab**: Exit Check In
Jan 17	Lecture	PODEMOS 1A19	Earthworm nervous systems	
Jan 18	Lab	York 1310	**Experiment #3:** Earthworm Experiments	**READ** Earthworm Protocol & **DUE @ Before Lab**: Complete Earthworm Pre-Lab Quiz
Jan 19	Lecture	PODEMOS 1A19	Writing lab reports	**DUE @ 11:59 PM**: String Lab Data

Course Schedule Subject to Change. (Due dates on Canvas)

Week 3

Jan 22		PODEMOS 1A19	The speed of the nervous system: Two-sample statistics	**Bring a Laptop to Class**
Jan 23	Lab	York 1310	In Lab Demonstration: Making Figures using python + **Experiment #3:** Earthworm Experiments/Analysis	Jupyter Hub Coding Intro
Jan 24	Lecture	PODEMOS 1A19	Intracellular & patch clamp recording	
Jan 25	Lab	York 1310	**Experiment #4:** Intracellular Equipment	**READ** Leech Intracellular Protocol **DUE in Lab**: Exit Check In
Jan 26	Lecture	PODEMOS 1A19	Intrinsic Physiology	**DUE SUNDAY NIGHT Jan 28 @11:59 pm**: Earthworm Lab Report Draft

Week 4

Jan 29	Lecture	PODEMOS 1A19	Leech Physiology & Cell Types	
Jan 30	Lab	York 1310	**Experiment #4:** Recording from the Retzius Cell of the Leech	**DUE @ Before Lab**: Complete Leech Pre-Lab Quiz
Jan 31	Lecture	PODEMOS 1A19	Visualizing the nervous system + Earthworm Draft Feedback Time	
Feb 1	Lab	York 1310	**Experiment #4:** Filling a cell in the Leech	
Feb 2	Lecture	PODEMOS 1A19	**Review for Midterm #1**	**DUE @ 11:59 PM** Earthworm Draft Peer Review Feedback

Course Schedule Subject to Change. (Due dates on Canvas)

Week 5

Feb 5	No Lecture	PODEMOS 1A19	**Midterm #1**	**IN PERSON EXAM**
Feb 6	Lab	York 1310	**Experiment #4**: Leech Lab Statistics + Analysis Day	
Feb 7	Lecture	PODEMOS 1A19	Motor Circuits and EMG	**Due @ 11:59 pm:** Leech Figures
Feb 8	Lab	York 1310	**Experiment #5:** EMG lab	
Feb 9	Lecture	PODEMOS 1A19	How to Read and Interpret Papers, Figures, and Stats	**Due @ 11:59 pm:** EMG Lab Quiz

Week 6

Feb 12	Lecture	PODEMOS 1A19	Drosophila behavior	**DUE @ 11:59 PM** Earthworm Lab Report
Feb 13	Lab	York 1310	**Experiment #6:** The Case of the Mislabeled Vials (Drosophila Behavioral Experiments)	READ your Drosophila behavioral handout **DUE @ 9AM:** Complete Drosophila Pre-Lab Quiz
Feb 14	Lecture	PODEMOS 1A19	Drosophila genetics & optogenetics	
Feb 15	Lab	York 1310	**Experiment #6:** The Case of the Missing Methods (Drosophila Optogenetic Experiments)	**DUE @ Before Lab:** Drosophila Methods Protocol
Feb 16	Lecture	PODEMOS 1A19	Recording & analyzing EEG signals	**DUE @ 11:59 PM:** Drosophila Methods Assignment

Course Schedule Subject to Change. (Due dates on Canvas)

Week 7

Feb 19			*No lecture — President's Day*	
Feb 20	Lab	**York 1310**	**Experiment #7:** EEG	**WATCH** Re-engineering the brain
Feb 21	Lecture	**PODEMOS 1A19**	**Introduction to final projects**	
Feb 22	Lab	**York 1310**	**Experiment #7:** EEG (Analysis), Project proposal preparation time, Drosophila Presentations	**DUE @ Before Lab:** Drosophila Presentation slides
Feb 23	Lecture	**PODEMOS 1A19**	Introduction to the Allen Brain Atlas + Neuroanatomy: Basal Ganglia	

Week 8

Feb 26	Lecture	**PODEMOS 1A19**	Mapping Neural Circuits	**DUE Feb 26th @ 11:59 pm: Project proposals**
Feb 27	Lab	**York 1310**	**Computer Lab #2**: Mouse brain connectivity	**Submit:** Final Project Equipment & Needs Survey
Feb 28	Lecture	**PODEMOS 1A19**	2 Photon, Optogenetics, and Genetic Engineering in Mouse	**DUE @ 11:59:** Computer Lab #2
Feb 29	Lab	**York 1310**	**Computer Lab #3**: Allen Brain Observatory (2p data)	
Mar 1	Lecture	**PODEMOS 1A19**	Human Neuroscience Techniques	**DUE @ 11:59:** Computer Lab #3

Course Schedule Subject to Change. (Due dates on Canvas)

Week 9

Mar 4	Lecture	PODEMOS 1A19	Review for Midterm #2	DUE @ 11:59: EEG Figures
Mar 5	Lab	York 1310	Work on final projects	
Mar 6	Lecture	PODEMOS 1A19	Midterm #2	IN PERSON EXAM
Mar 7	Lab	York 1310	Work on final projects	
Mar 8	Lecture	PODEMOS 1A19	Careers in neuroscience	

Week 10

Mar 11	Lecture	PODEMOS 1A19	Final Projects Consultations	
Mar 12	Lab	York 1310	Final Projects analysis & presentation preparation	
Mar 13	Lecture	PODEMOS 1A19	Final project presentations	(Volunteers to Go Early)
Mar 14	Lab	York 1310	Final project presentations	DUE Before Lab: **Final Presentations**
Mar 15	Lecture	PODEMOS 1A19	Final project presentations	(If necessary)
				DUE Mar 20th @ 11:59 pm: **Final project lab reports**