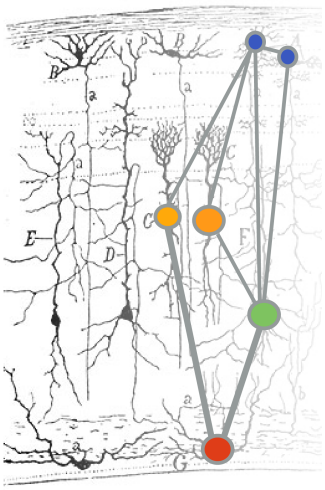

# BIPN 145 Neurobiology Laboratory

Fall 2023


**Instructor**
Ashley Juavinett

**Instructional Assistant**
Ahmed Abushawish

**Office hours**
Mondays @ 1 pm
*unless otherwise specified*
@ Mandeville Coffee Cart
*(or by appointment)*

**Staff Research Associate**
Haley Stott


**Lecture:** MWF 11-11:50 AM in Mandeville B-104
**Lab:** WF 12:30 - 3:50 PM in York 1310

**Course website:** https://sites.google.com/ucsd.edu/bipn145

## 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
- **Develop** an appreciation for and practical insight into the process of research
- **Communicate** research to peers as well as a broader audience

### Attendance Policies

You are expected to attend our in-person lab sessions, but lecture attendance is not mandatory. However, as you soon will see, even our lecture sessions will not be unidirectional — these will be active learning sessions where we co-create our learning. These lecture sessions will be podcasted/recorded, but you will be expected to make up any in-class activities that you missed.

If you cannot attend a lab session due to a positive COVID-19 test, exposure, or for any other reason, **please contact both Dr. J and IAs ASAP so that we can work with you on accommodations.**

**Enrolled and waitlisted students must attend the first lab session (Oct 4).** Additional details: http://biology.ucsd.edu/go/ug-labs. You do not need to inform us if you will be missing a lecture session.

Updated Sep 25, 2023

### Additional resources

There is a list of resources listed here to help you thrive this quarter. If there is anything you think we can help you out with, please feel free to reach out to the IAs or Dr. J.

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## Grading

**Laboratory reports** *(200 pts, 75-100 pts each)*
Data collected as a group, **written individually**

**Assignments** (350 pts, *20-50 pts each*)
Includes smaller lab write-ups, pre-lab quizzes, and in-class assignments

**Final group project** *(225 pts)*
Project proposal, presentation, and written report

**Midterms** *(200, 100 pts each)*

**Professionalism** *(25 pts)*

### Late Assignments

- 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: https://forms.gle/SAeRJKyCWRtdhbFx7.
- Assignments not protected by the late bank will lose -10% for each day they are late.
- In the case of extenuating circumstances requiring a submission more than three days late, please contact Dr. J directly.

### Additional notes on grading

- 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 positive 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 so on.
- 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 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 participant, 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.

### This course, and the work it entails, is for *you*

So, you won't benefit if others (or a generative AI) 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/

### 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. **You will *not* be allowed into the lab for the second in-person lab session unless you have successfully passed the safety assessment.** Note that you **do not need to bring your own personal protective equipment** (e.g. a lab coat or goggles) for this course. We will provide gloves when needed.

## Course management & texts

### Lab Manual

BIPN 145 has a lab manual! You can purchase it in the bookstore by searching for our course. Previous versions of the manual are fine.

### 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.

### DataHub

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

### Textbook

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, or on the course website.

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## Software for this class

It will be helpful to have the following software on your computer, since you'll often need to rely on a personal computer. 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.

### Microsoft Office

It may be 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** — **You can find readings & due dates for assignments on Canvas.**

| Date | | Location | Topic | Due/Reading |
|---|---|---|---|---|
| **Week 0** | | | | |
| Sept 29 | Lecture | MANDE B-104 | An introduction to BIPN 145 & nervous systems | Take the incoming survey |
| | *Lab* | | *No lab on this day* | |
| **Week 1** | | | | |
| Oct 2 | Lecture | VIRTUAL [Zoom] | The passive neural membrane | Take the incoming survey |
| Oct 4 | Lecture | MANDE B-104 | Modeling neural activity | |
| | Lab | York 1310 | Neuromembrane (Note: This experiment is not in your lab manual! It can be found here.) | Take the online safety test https://biolabclass-safetyquiz.ucsd.edu/ |
| Oct 6 | Lecture | MANDE B-104 | Introduction to coding & statistics | DUE @ 5 pm: Neuromembrane Quiz |
| | Lab | York 1310 | **Experiment #1**: RC Circuits | |
| **Week 2** | | | | |
| Oct 9 | Lecture | MANDE B-104 | Recording from the nervous system | DUE @ 5 pm: RC Circuit Quiz |
| Oct 11 | Lecture | MANDE B-104 | The action potential | **READ** Hodgkin & Huxley (1939) |
| | Lab | York 1310 | **Experiment #2:** String Lab | |
| Oct 13 | Lecture | MANDE B-104 | Earthworm nervous systems | DUE @ 5 pm: String Data |

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| | Lab | MANDE B-104 | **Experiment #3:** Earthworm Experiments | **READ** Earthworm Protocol & **Complete Earthworm Pre-Lab Quiz** |

## Week 3

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|---|---|---|---|---|
| Oct 16 | Lecture | MANDE B-104 | Writing lab reports | |
| Oct 18 | Lecture | MANDE B-104 | The speed of the nervous system | |
| | Lab | York 1310 | **Experiment #3:** Earthworm Experiments/Analysis | |
| Oct 20 | Lecture | MANDE B-104 | Intracellular & patch clamp recording | |
| | Lab | MANDE B-104 | **Experiment #4:** Intracellular Equipment | **Complete Leech Pre-Lab Quiz** |

## Week 4

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|---|---|---|---|---|
| Oct 23 | Lecture | N/A | Leech Physiology & Cell Types | **DUE @11:59 pm:** Earthworm Lab Report |
| Oct 25 | Lecture | MANDE B-104 | Coding in neuroscience **In-Class Assignment** | |
| | Lab | York 1310 | **Experiment #4:** Recording from the Retzius Cell of the Leech | |
| Oct 27 (drop deadline) | Lecture | MANDE B-104 | **Review for the midterm** | |
| | Lab | York 1310 | **Experiment #4**: Filling a cell in the leech | |

## Week 5

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|---|---|---|---|---|
| Oct 30 | *No Lecture* | MANDE B-104 | **Midterm #1** | |
| Nov 1 | Lecture | MANDE B-104 | Motor circuits & EMG | |
| | Lab | York | Analysis & Catch Up Day | |

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|---|---|---|---|---|
| | | 1310 | | |
| Nov 3 | Lecture | MANDE B-104 | Introduction to final projects | DUE @ 5 pm: Leech Figures |
| | Lab | York 1310 | **Experiment #5:** EMG lab | |

## Week 6

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|---|---|---|---|---|
| Nov 6 | Lecture | MANDE B-104 | Ethology & behavior | **DUE @ 5 pm**: EMG Quiz |
| Nov 8 | Lecture | MANDE B-104 | Drosophila behavior<br>In-Class Assignment | READ your Drosophila behavior handout |
| | Lab | York 1310 | **Experiment #7:** The Case of the Mislabeled Vials | |
| Nov 10 (deadline to drop w/ "W") | Lecture | | *No Class or Lab (Veteran's Day)* | |
| | Lab | York 1310 | | |

## Week 7

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|---|---|---|---|---|
| Nov 13 | Lecture | MANDE B-104 | Drosophila genetics & optogenetics (with Dr. Bella Maita) | **WATCH** Re-engineering the brain |
| Nov 15 | Lecture | MANDE B-104 | Electroencephalography (EEG) | DUE THURSDAY @ 11:59 pm: Drosophila Presentation slides |
| | Lab | York 1310 | **Experiment #7:** The Case of the Missing Methods | |
| Nov 17 | Lecture | MANDE B-104 | Drosophila Presentations | DUE SUNDAY @ 11:59 pm: Project proposals |
| | | York 1310 | **Experiment #8: EEG** | |

## Week 8

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|---|---|---|---|---|
| Nov 20 | Lecture | MANDE B-104 | Visualizing the nervous system | DUE @ 5:00 pm: Drosophila Methods |

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| Nov 22 | Lecture | MANDE B-104 | Mapping neural circuits | **Submit** Final Project Equipment & Needs Survey |
| | Lab | York 1310 | Mouse brain connectivity | **DUE @ 11:59 pm**: EEG Lab Report |
| Nov 24 | Lecture | MANDE B-104 | *No Class — Thanksgiving Break* | |

## Week 9

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|---|---|---|---|---|
| Nov 27 | Lecture | MANDE B-104 | 21st Century Neuroscience Techniques | **DUE @ 5 pm**: Mouse brain connectivity |
| Nov 29 | Lecture | MANDE B-104 | **Review for Midterm #2** | |
| | Lab | York 1310 | **Work on final projects** | |
| Dec 1 | Lecture | MANDE B-104 | **Midterm #2** | |
| | | York 1310 | **Work on final projects** | |

## Week 10

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|---|---|---|---|---|
| Dec 4 | Lecture | | Careers in neuroscience | |
| Dec 6 | Lecture | MANDE B-104 | **Expectations for final project presentations** | |
| | Lab | York 1310 | **Work on final projects** | |
| Dec 8 | Lecture | MANDE B-104 | Final project presentations | |
| | Lab | York 1310 | Final project presentations | |

**DUE DEC 13th @ 11:59 pm:**
Final project lab reports