

Nsc 230: Experimental Methods in Neuroscience Fall 2023 (Section 2) Lecture

Instructor: Mary Harrington (she/her)
with Lab Instructor: Narendra Pathak (he/him)

Ways to contact Prof. Harrington: x3925, Sabin Reed 429, (mharring@smith.edu) **Office Hrs:** See [my appointment calendar](#)

Featuring: Harrington, M (2020) *The Design of Experiments in Neuroscience*. Cambridge.

How to get a copy of the textbook: You can get a copy from our library to use for the semester if you wish. Go to the Central Service Point in Neilson Library. The books are on our Reserves shelves in the "Semester Loan" section.

Located in: Sabin Reed 325 TTh 925-1040am, and (lab) Sabin Reed 428, W 120-4 or 7-930 pm

Academic Accommodations: If you have a disability and would like accommodations in this course, please contact the Office of Disability Services in College Hall 104 or at ods@smith.edu as soon as possible to ensure that we can implement accommodations in a timely manner.

We strive for **Universal Design for Learning** in this course. This is a process, we are learning more as we go, and we will aim to improve our efforts throughout the semester. Please come talk to us during office hours if you have suggestions for how we might better help you learn, or how we might better help other students.

WHAT WILL YOU LEARN???

By actively participating in this course, you will:

- 1) **READ:** Gain understanding of how to read, interpret and critique reports from other scientists,
- 2) **RESEARCH:** Learn to design, conduct and analyze your own scientific experiments,
- 3) **USE YOUR HANDS:** Become familiar with a variety of laboratory techniques used in the field of neuroscience,
- 4) **DOCUMENT:** Learn how to keep an excellent lab notebook and
- 5) **COMMUNICATE:** Improve your skills in reporting your research through posters and writing scientific papers.

What does a week look like?

SUNDAY by 5pm, submit your journal entry on Moodle, complete your participation form.

TUESDAY by 925am, be prepared for class, including the WEEKEND READING

WEDNESDAY be prepared for lab

THURSDAY by 925am, be prepared for class

Individual work due dates:

- Tues Sept 26 - Article Critique 1
- Thurs Oct 12 - Article Critique 2
- Nov 7 - Midterm Methods/Results full drafts
- Fri Nov 17 Midnight - Final Midterm Methods/Results
- Thurs Nov 30 - Article Critique 3
- Tue Dec 19 - Final Abstract/Introduction/Discussion/References due 5pm

Team work due dates:

- Th Sep 21: Team rules and video
- Wed Oct 11: IACUC form *draft started*
- T Nov 28: Draft Methods/Results
- Wed Dec 6: Draft Poster Presentations
- Tues Dec 12 - Final Presentations in class; Final Methods/Results Due by 9pm

Week 1 – Sep 7-8.

Th: Introductions. Complete Health forms. Orientation to the JYI assignments. Introduction to CITI training.

- **Journal of a Young Investigator (JYI)** – (Write by Sun Sep 10 at 5pm, post on Moodle. This continuing assignment will be added to each week. No need to “submit” the assignment. Complete your entry by Sunday 5pm)
- **Record your name on NameCoach**
- **Complete CITI training**

Week 2 – Sep 11-15: Descriptive studies

- Readings for this week: pages 233-266 from “Ethical Issues in Scientific Research” (on Moodle), “Design of Experiments in Neuroscience” Chapter 1 and 2

T: Discuss reading from “Ethical Issues in Scientific Research” and Chs 1 and 2.

W: Lab-Become familiar with Zebrafish: our research model

Th: Select date for class dinner. Animal use training. What is a “weekend reading”?

- **Journal of a Young Investigator (JYI)** by Sun 5pm
- **Self-report participation** by Sun Sep 17 5pm. Explain any absences.
- **Weekend reading 1 for next Tuesday: posted on Moodle**

Week 3 – Sep 18-22: Descriptive studies

- Readings for this week: “Design of Experiments in Neuroscience” Chapter 3 and 4, and example article critique on Moodle. Personal strengths materials posted on Moodle.

T: MOUNTAIN DAY!!!! Discuss weekend reading 1. Discuss textbook readings for the week (Chs 3 and 4, sample article critique). Article for the critique due next week will be posted after class.

W: Dive deep into observing/manipulating zebrafish embryos

Th: Team time: Meet with your team to finalize ground rules (post rule on Google doc) and discuss personal strengths.

Complete worksheet (share with team members, not instructors). Brainstorm ideas for your final zebrafish experiment - submit a video with all of you at a white board contributing ideas and critiquing other ideas. {Mary will be out of town Sep 21-22}

- Team ground rules and brainstorm video posted to Google drive shared with Instructors by Thu Sep 21
- **Self-report participation, Weekend-reading 2, JYI, by Sunday 5pm**
- Start the article critique once the article is posted on Moodle. This is individual, not team, work.

Week 4 – Sep 25-29: Descriptive studies

- Reading for this week: Design of Experiments in Neuroscience, Ch 5

T: Team time: Develop ideas for your final zebrafish experiment. Introduction to database search tools

W: Profile neuroglial cell types in the developing zebrafish brain by imaging expression patterns of Transgenes/ and their corresponding endogenous genes (Learn the theory of Transgenes, and use of Hybridization Chain Reaction)

Th: Discuss article critique. Discuss textbook readings.

- **Due: First article critique (article and questions posted on Moodle) – email or hand in by 925am, Tuesday Sep 26:** use the form provided and try to keep to space provided, can be typed or hand-written. **Article critiques are individual (not team) assignments and should reflect your individual effort only.** Write in your own words.
- **Self-report participation, JYI by Sunday 5pm**
- **Weekend reading selected to relate to your team project**

Week 5 – Oct 2-6: Experimental variables

- Reading for this week: Design of Experiments in Neuroscience, Ch 6

T: Discuss Article Critique 1 and Ch 6 textbook. Review identifying variables in an experiment. Review experimental designs.

W: Learn to Objectively analyze/quantify images (using Fiji/Image J). Brainstorm ideas for team based Independent projects.

Th: Discuss weekend readings. Identify experimental variables and experiment designs.

- **Self-report participation, JYI by Sunday 5pm**

Week 6 – Fall break! Oct 11-13: Planning your experiment

- Reading for this week: In “Design of Experiments in Neuroscience” Ch 7 and 8

W: Relate neuroglial cell types in developing Zebrafish to their functional counterparts in mammalian (mouse).

Learn to section/Stain mouse brain slices.

- Submit IACUC proposal for Independent team projects *as a draft*

Th: Discuss Chs 7 and 8 textbook. **Article critique 2 due.**

- **Due: Second article critique at start of class Thurs Oct 12.**
- **Self-report participation, JYI by Sunday 5pm**

Week 7 – Oct 16-20: Designing your experiments

- Reading for this week: In “Design of Experiments in Neuroscience” Ch 9

T: Discuss article critique 2. Designing your experiments

W: Explore mouse neuroanatomy using resources available on Allen Brain website/Start working on team projects

Th: Presentations of experiment plans

- **Self-report participation, JYI, by Sunday 5pm**

Week 8 – Oct 23-27: Writing Methods and Results

- Reading for this week: In “Design of Experiments in Neuroscience” Ch 10

T: Orientation to mid-term Methods and Results write-up.

W: Work on Independent team projects/ Learn to compose figures to be used in reports/ presentations

Th: Writing the results section. Making graphs using R.

- **Self-report participation, JYI by Sunday 5pm**
- **Weekend reading 3**
- **Team peer evaluation by Sunday 5pm**

Week 9 – Oct 30 – Nov 3: more on Writing Methods and Results

T: Data analysis using R.

W: Work on Independent projects

Th: Cromwell Day – participate in the events

- **Due: First Methods/Results Drafts due by Tues Nov 7 925am – submit by email. This is an individual report.**
- **Self-report participation, JYI**

Week 10 – Nov 6 - 10: Independent Research Projects

T: Discuss weekend reading 3.

W: Work on Independent projects

Th: Guest: Dr. Siobhan Crilly (by Zoom)

- **Self-report participation, JYI, by Sunday 5pm**
- **Team weekend reading (selected with team)**

Week 11 – Nov 13 - 17 : Independent Research Projects

T: Team time.

W: Work on Independent projects

Th: Work on reports, statistics. Image analysis.

- **Due: Final Methods/Results papers due from each student by Midnight 5PM, Fri Nov 17, submit by email.**
- **JYI by Sunday 5pm (no further participation forms required! Reach out directly if you would like to discuss your participation.)**

Week 12 – Nov 20-21: Independent Research Projects

T: Held over zoom - discussion on how to write an abstract, introduction, and discussion

Week 13 – Nov 27-Dec 1: Independent Research Projects

- Draft team authored methods and results

T: ImageJ. Discuss report drafts.

W: Work on Independent projects

Th: Writing the final report Methods and Results in groups

- **JYI by Sunday 5pm**
- **Final article critique due Nov 30 by the start of class (9:25 AM)**

Week 14– Dec 4-8: Reflection

T: Guest: [Elise Gowen](#)

W: Time for group work

Th: Guest:

- **Due: group project report** (written methods and results; projected poster presentation; <5 min video abstract; team-authored) DEC 12 5pm
- **JYI final entry- and submit JYI by Sunday 5pm**
- **Team peer evaluation forms by Sunday 5pm**

Week 15 - Dec 11-14 Final presentations and celebration of your growth as neuroscientists :)

T: Presentations

W: free time for group work

Th: Celebration

- **By Tues Dec 19 : Final paper and video due** (Individual work in authoring all but the team-authored methods and results).

Assessment:

25% of your grade: critical reading of original articles (all individual work)

- Article Critique 1: 5%
- Article Critique 2: 5%
 - Update: I will count the highest score from AC1 or AC2 as 10%
- Final Article Critique: 15%

50% of your grade: presenting scientific posters and articles, designing and interpreting an experiment

25% - Lab grade (Dr. Pathak): see Lab syllabus. Final project methods and results, group authored.

25% - Class grade (Dr. Harrington):

- Experimental Report 1 - individual work: 15%
- Experimental Report 2 - Final project; abstract, intro and discussion-individual work: 10%

25% Other Stuff

- 10% Class Involvement: for resourceful and responsible conduct in the lab (5%), high quality participation in the discussion of readings and strong efforts in reading responses (4%) and participation in extra-class events (1%). Self-assessed and instructor-assessed.
- 10% Teamwork - assessed by peer evaluation forms Week 8 and Week 14
- 5% "Journal of a Young Investigator" – Journal style writing throughout the semester with your personal reactions, thoughts, ambitions, etc.- full credit for entries submitted on time.

Special rules: Late assignments will be marked down 5% for every day late, unless otherwise noted.

- ✓ **Each student can take a 48 h extension on any graded assignment. Just email an instructor with the message "taking 48h free extension" to claim this. No need to explain reasons.**