Instructor: Mary Harrington: x3925, Sabin Reed 429, (mharring@smith.edu) Office Hrs: M 11-12 and F 3-4 or by appt.
Lab Instructor: Narendra Pathak, Sabin Reed 433, npathak@smith.edu
       Santiago Ramon y Cajal, Advice to a Young Investigator (you can get this in the library or as electronic)
Class meets in Bass 102 MWF 825-915, and Sabin Reed 428, T 120-4

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.

Please come talk to me during office hours if you have suggestions for how I might better help you learn.

Below is an overview of the entire course, followed by a detailed syllabus. The precise timing of this schedule may change depending on how our experiments progress.

Overview:
A. Descriptive neuroanatomical studies
Learn to cut and stain brains. Use Allen Brain Atlas to conduct research on a brain region.
Graphic presentation of data, preparing a scientific poster.

B Zebrafish experiment
Conduct an in-class experiment with zebrafish. Learn multiple techniques.
Data analysis using R and Prism software.
Writing a paper for publication: Methods and Results sections.

C. Independent Research Projects
Finding previously published research on a selected topic.
Designing and conducting an experiment. Analyzing the results. Final paper (all sections) and poster presentation.

GOALS
There are several goals in NSC 230. 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.

I will also spend some time talking with you about career options, and life as a scientist. It is my goal that participation in this course will help you choose your career path and will give you skills to succeed in the scientific workplace.

What are YOUR goals for this course?
First class – Sep 6
F Sep 6: Introductions. Complete Health forms and team letters. Advice about learning Zotero software and coding in R.
✓ Weekend reading: posted on Moodle
✓ Journal of a Young Investigator (JYI) – (Write by Sun Sep 8 at 5pm, post on Moodle. This continuing assignment will be added to each week. No need to “submit” the assignment.)
✓ Record your name on NameCoach

Week 1 – Sep 9-13: Descriptive neuroanatomical studies
✓ Readings for this week: General reading on lab notebooks, pages 233-266 from “Ethical Issues in Scientific Research” (on Moodle), “Design of Experiments in Neuroscience” Chapter 1
M: Discuss weekend reading. Discuss team strengths. Begin work on ground rules. Select date for class dinner.
Lab: The mouse brain.
W: Discuss reading from “Ethical Issues in Scientific Research: An Anthology”.
F: Team time: Meet with your team to finalize ground rules. Draft as a team a 2 paragraph background on the brain ROI you have chosen. Distill this to 5-6 bullet points for your poster. Post on your Google doc and share with instructors.
✓ Team ground rules posted to Google doc shared with Mary and Naren by Fri Sep 13 5pm
✓ Self-report participation by Sun Sep 15 5pm. Explain any absences.
✓ Journal of a Young Investigator (JYI)
✓ Weekend reading for next Monday: posted on Moodle

Week 2 – Sep 16-20: Descriptive neuroanatomical studies
✓ Readings for this week: “Design of Experiments in Neuroscience” Chapter 2 and 3, and example article critique in Appendix C.
M: Briefly discuss weekend reading. Animal Use training. (required CITI training prior to lab)
Lab: The mouse brain.
W: Discuss textbook readings for the week (Chs 2 and 3, Appx C). Descriptive statistics and scales of measurement.
F: Working on your figure
✓ Self-report participation, JYI, Weekend reading
✓ Start the article critique once the article is posted on Moodle this weekend. This is individual, not team, work.

Week 3 – Sep 23-27: Descriptive neuroanatomical studies
✓ Reading for this week: “Seeking alternatives”, on Moodle. Design of Experiments in Neuroscience, Ch 4 and Appx A pp 139-149
M: Discuss weekend reading. Team time: Brainstorm ideas for your final zebrafish experiment.
Lab: The mouse brain.
W: Discuss Article critique – due at start of class, not accepted late.
F: Discuss “Seeking alternatives” and textbook readings.
✓ Due: First article critique (article and questions posted on Moodle) – email or hand in by 825am, Wednesday Sep 25; use the form provided and try to keep to space provided, can be typed or hand-written. Late article critiques are not accepted. Article critiques are individual (not team) assignments and should reflect your individual effort only.
✓ Self-report participation, JYI, Weekend reading
✓ Due: Team Neuroanatomical Poster; see Lab syllabus

Week 4 – Sep 30-Oct 4: First Poster Presentations. Introduction to zebrafish.
✓ Reading for this week: Design of Experiments in Neuroscience, Ch 5 and Appx A pp 149-160.
M: Discuss weekend reading. Close reading in class.
Lab: Introduction to zebrafish
W: Poster presentations
F: Discuss readings. Review experimental designs.
✓ Self-report participation, JYI, Weekend reading
✓ Note: Second article critique – due by 825am Mon Oct 7.

Week 5 – Oct 7-11: Mid-term zebrafish experiment
✓ Reading for this week: In “Design of Experiments in Neuroscience” Chs 6-7
M: Discuss weekend reading. Article critique due. Discuss article critique 2. Discuss Chs 6-7 textbook.
Lab: DATA for mid-term experiment paper
W: Team time. Planning final projects
F: Lab time.
  ✓ Due: Second article critique at start of class Mon Oct 7.
  ✓ Self-report participation, JYI, Weekend reading

Fall Break! Oct 12-15

Week 6 – Oct 16-18: Mid-term zebrafish experiment
W: Correlational designs. Data analysis
  ✓ Team peer evaluation by 5pm Oct 18.
  ✓ Self-report participation, JYI, Weekend reading

Week 7 – Oct 21-25: Writing Methods and Results {Mary will be out of town Oct 21-23}
  ✓ Reading for this week: In “Design of Experiments in Neuroscience” Appx B.
M: Class cancelled. Work on preparation of reports.
Lab – DATA for mid-term experiment paper
W: Writing up the methods sections – Naren will lead this class
F: Discuss weekend reading. Writing the results section. Making graphs using Prism and R. Draft Methods due in class.
  ✓ Due: Proposal of independent research project proposal due from each team in lab Oct 22
  ✓ IACUC Form due by 10-25-19.
  ✓ Self-report participation, JYI, Weekend reading

Week 8 – Oct 28 – Nov 1: more on Writing Methods and Results
M: Discuss weekend reading. Data analysis using R
Lab - Present plans for final projects. Submit IACUC form by 11-1-19.
W: Data analysis. The ANOVA.
F: Work on projects
  ✓ Due: First Zebrafish Expt Drafts due by Wed Oct 30 825am – submit by email. This is an individual report.
  ✓ Self-report participation, JYI, Weekend reading

Week 9 – Nov 4-8: Independent Research Projects
M: Discuss weekend reading.
T-W: Conduct team projects.
F: Discuss stereotaxic surgery, AAV viral vectors, ABA connectivity atlas
  ✓ Self-report participation, JYI, Weekend reading

Week 10 – Nov 11-15 : Independent Research Projects {Mary will be out of town}
M-F: Team time
  ✓ Self-report participation, JYI, Weekend reading

  ✓ Reading for this week: Chs 1-4 in Ramon y Cajal’s “Advice for a Young Investigator”
M Discuss weekend readings.
Lab: Work on projects. Complete lab work this week if possible.
W: Draft figures for results
F: Discuss Cajal readings, come with selected quotes.
  ✓ Due: Final Zebrafish Expt papers due from each student by 825am, Mon Nov 18, submit by email.
  ✓ Optional Article critique 3 due 825am Nov 15
  ✓ Self-report participation, JYI, Weekend reading

Week 12 – Nov 25-26: Independent Research Projects
  ✓ Reading for this week: Ch 5-9 in Ramon y Cajal’s “Advice for a Young Investigator
M: Discuss weekend reading. Discuss Cajal readings
Lab - Present poster in progress.
  ✓ Self-report participation, JYI, Weekend reading

**Week 13 – Dec 2-6: Independent Research Projects**
M: Working on the Posters
T: ****Final article critique Tues Dec 3**** meet in McConnell B15
W – F: Team time
  ✓ Due: poster file ready to send for printing. By end of the day Wednesday.
  ✓ Self-report participation, JYI

**Week 14 – Dec 9-12: Reflection**
M: Discuss writing the intro and discussion. Review
Lab – Final poster presentations and reflections
W: Go out to a bakery together or sleep in!
  ✓ Due: group project report (methods and results; team-authored)
  ✓ JYI
  ✓ Team peer evaluation forms by Dec 12.

By Fri Dec 20: Final paper 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)
  o Article Critique 1: 5%
  o Article Critique 2: 5%
  o Optional AC3, can replace lowest grade AC1 or AC2
  o Final Article Critique and Expt proposal : 15%

50% of your grade: writing scientific posters and articles, designing and interpreting an experiment
  25% - Lab grade (Dr. Pathak):
  25% - Class grade (Dr. Harrington):
    o Experimental Report 1 (Zebrafish study – draft Oct 30, final Nov 18 - individual work): 15%
    o Experimental Report 2 (Final project; abstract, intro and discussion-individual work): 10%

25% Other Stuff
  o 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.
  o 10% Teamwork - assessed by peer evaluation forms Week 5 and Week 12
  o 5% “Journal of a Young Investigator” – Journal style writing throughout the semester with your personal reactions, thoughts, ambitions, etc. (grading: for each: 1 point if done on time, 0.5 point if done late)

Special rules: Late assignments will be marked down 5% for every day late, unless otherwise noted. No late article critiques will be accepted.

Each student gets two 24 h extensions on any assignment except an article critique. Just email me with the message “taking 24h free extension” to claim this.