BIPN 194 Advanced Topics in Modern Biology:
Neuron-Glia Interactions in Health and Disease
Fall 2018

Class Meeting Time: Thursday 12:30PM- 1:50PM
Location: Salk Institute, HHMI Room

Professor: Sam Pfaff
Instructors: Lydia Daboussi, Tom Glenn
*Email***:** ldaboussi@ucsd.edu; tglenn@ucsd.edu. Note: please include "BIPN194" in the subject line of emails concerning this class. If your email requires an elaborate reply, please see me before or after class, or during my office hours.

*Office Hours***:** Thursdays 2-3 PM, and by appointment; HHMI Room Salk Institute

Each presentation group will meet with us on Tuesday of the week they are presenting a paper in class. Members of the group must coordinate their schedules and then a representative should coordinate with us to find a time we can meet.

Course Website: There will be a TritonED site for the course (tritoned.ucsd.edu). Student accounts will be added on the first day of class. **Announcements, updates, postings, required reading material and grades will be communicated on the course website using TritonED.**

Course Overview: Glia are critical non-neuronal cells that support neuronal development and function in the central and peripheral nervous system. Historically, glia have been recognized as providing structural and metabolic support for neurons, but recent studies have demonstrated that glia also play active roles in synapse formation, synapse pruning, formation of the blood-brain barrier, and in the nervous system response to injury and disease states. There are several classes of glia, each of which has developed unique and specialized functions in maintaining neuronal function.

Course Format: The first two lectures will be instructor taught. All other course meetings will be student-led discussions of primary research literature. Each student will take part in two group presentations. All meetings will be very interactive, with all students participating in discussions of the presentation. **Expect to spend at least four hours/week on the assigned reading and summary preparation, and 10+ hours the week you are presenting a paper.**

*Prerequisites***:** Upper division knowledge of genetics, cell biology, molecular biology, and neurobiology is assumed. BICD 100 (Genetics), and BIPN 140 (Cellular Neurobiology) are strongly recommended.

Course materials: PDFs of the required readings will be posted on the course website. There is no course textbook, but textbooks from other courses may help with general background.

Evaluation: **There is no final exam. Your grade will be determined by:**

1. Your performance during your groups' presentation. (40%)
2. Your participation in class. (20%)
3. Your summaries of papers being presented each week. (40%)
    - These are due at the beginning of class. Please turn in a hard copy of your summary at the beginning of class and post your summary on the class website (as a Word doc) by 9AM on the day of class. **Late papers will not be accepted, nor will papers be accepted by email**.

ASSIGNMENTS AND GRADING

Attendance is mandatory. **Because of the discussion basis and the limited meetings of this course, missing even one class will impact your ability to meet the participation requirement.**
Documented medical or family emergencies will be accepted as excuses for missing the class. Please consult instructors for make-up assignments. Students will be expected to participate in the discussion of assigned papers during the class and to ask questions during the presentation. Arriving late may impact your participation grade.

Weekly assignments. You are required to read the assigned paper and write a one page, single spaced document that summarizes the assigned paper, except on the day you are presenting. Use 12 point Times New Roman (or similar font) and 1 inch margins. For your summary you should address:

1. What is the overall scientific question being asked?
2. Why is this question important?
3. What are the strengths and weaknesses of the methodology used to test these hypotheses?
4. What conclusions did the authors arrive at from their experiments? Are the conclusions well supported by the data?
5. What part of the paper did you find the least convincing or the most confusing? Why?
6. What are the next experiments that follow from the author's findings in the paper?
7. What are the implications for these findings in the field of glial neuroscience?
8. What are two questions you have about the paper?

Brevity is important in science, but if you need to slightly exceed one page to address these issues that is OK.

Presentations: Each group will have 40 minutes for the presentation and 15-20 minutes for questions and discussion. Each group member will have equal presentation time and should be prepared to answer questions and engage the class in discussions. It is the expectation that each group will clearly present the question/concept being tested in the paper, the approaches by which the question was tested, and the significance of the paper. You will need to look up any background information or terminology that you are not familiar with so that you can explain it to the class.

Group meetings for the presentation: Each group of presenters needs to exchange contact information (phone numbers and email information) and arrange meetings to discuss the overall presentation and how the sections will be divided among group members. These meetings are essential. Each group will also meet with the instructors on the Tuesday before the presentation date to discuss the presentation and help with questions. If the group cannot meet on Tuesday, an alternate time can be coordinated with the instructors, but this is a mandatory meeting that will help with your presentation. Each group member should be prepared for this meeting and have read the paper and prepared 5-6 slides. After our meeting, the group may wish to meet again to finalize the presentation.

The group's entire presentation needs to be on one computer in one file (i.e., Powerpoint, Keynote, or a format agreed upon by the entire group) and the presentation needs to be backed up on a memory stick. The presentation needs to be uploaded onto the website by 9 AM on the Thursday that you give your presentation. *The presenting group must arrive 15 minutes early to set up. You are responsible for arranging to have the appropriate adaptor to connect the presentation computer to the VGA projector.* Please discuss this with the instructors at you pre-presentation meeting to ensure that the appropriate adapter is available.

The Presentation

Background/Introduction: In this part of the presentation you need to describe the biological question that the authors are asking. You will need to provide the necessary background for the paper so that your audience can understand the importance of the authors' question.

Results: Here you need to logically present the experimental results. How did the authors address their question? Explain the tools and methodology that the authors use to address the question. What are the specific conclusions from their results? We recommend that each group member present one or two figures each. Most figures in papers have multiple panels. Many papers have supplementary figures that support the main figure and these are required reading for the paper. You will need to decide which of the panels in a figure to present and if any supplemental figures should be presented. For each figure, you should explain what is being tested and why. Most figures have one or two main conclusions. Be sure you are clear about these and can explain these to the class. Experiments require proper controls, also make sure you understand why the given controls were used. Discuss reservations, if any, about the data.

Conclusions and implications: Overall, what are the findings of this paper? Does the data support the conclusions? What are the next steps that follow from these experiments? How do the data impact the field?

Non-presenters: You are expected to read every paper before coming to class and be prepared to discuss and ask questions. During class, you are expected to actively participate in the discussion, ask questions, and remain engaged.

Technology Etiquette: Please refrain from operating personal internet or

communications devices during class and ensure that your cell phones and tablets are turned off. If you have a compelling reason that such devices remain on, please talk to the instructors before class.

Academic Integrity: Academic dishonesty will not be tolerated. According to UCSD policy, academic dishonesty includes:

- Completing assignments for another student or allowing another student to complete an assignment for you
- Copying another student's work or allowing another student to copy your work
- Incorporating plagiarized material into assignments.

All instances of academic dishonesty will be reported to the Academic Integrity Office. Students will receive a final grade of 'F' if academic dishonesty is confirmed and other disciplinary actions deemed appropriate by the Academic Integrity Office.

Equity, Diversity, and Inclusion.
We believe very strongly that the classroom is a place to expand our knowledge and experiences safely, while being respected and valued. We support the values of UC San Diego to "create a diverse, equitable, and inclusive campus in which students, faculty, and staff can thrive". We strive to uphold the values articulated by the Office of the Vice Chancellor for Diversity, Equity, and Inclusion: "We believe that true excellence is achieved through productive relationships among people of diverse perspectives. When the collective talents of our students, faculty, and staff at UC San Diego are united in an environment that is open and inclusive, creativity and innovation prospers." I hope you will join us in creating a class that upholds these values to further enhance our learning as a community.

COURSE SCHEDULE

Date	Topic	Background Reading	Discussion Paper
September 27	***Introduction and Organization of the Course***	*Glia- More than just brain glue* *The Mystery and Magic of Glia*	**None this week**
October 4	**Instructor Led Presentation on OPCs and Adult Myelination**	*A new mechanism of nervous system plasticity: activity-dependent myelination*	*Motor skill learning requires active central myelination*
October 11	**Oligodendrocytes: Myelination and Axonal Support**	*Glia-neuron energy metabolism in health and diseases* *Oligodendrocytes: Myelination and Axonal Support*	*Oligodendroglia metabolically support neurons and contribute to neurodegeneration*

October 18	**Peripheral Nervous System Glia and Axon Maintenance**	*Axons hooked to Schwann cell metabolism* *Schwann cells provide life support for axons*	*Metabolic regulator LKB1 is crucial for Schwann cell–mediated axon maintenance*
October 25	**Wallerian Degeneration**	*Schwann cells: Development and Role in Nerve Repair*	*Schwann cell autophagy, myelinophagy, initiates myelin clearance from injured nerves.*
November 1	**Peripheral Nerve Regeneration**	*The repair Schwann cell and its function in regenerating nerves*	*mTORC1 Is Transiently Reactivated in Injured Nerves*
November 8	**Astrocytes and Synapse Development**	*Cell biology of astrocyte-synapse interactions*	*Astrocytes mediate synapse elimination through MEGF10 and MERTK pathways*
November 15	**Astrocytes and CNS regeneration**	*Regeneration: Not everything is scary about a glial scar* *Dissecting spinal cord regeneration*	*Astrocyte scar formation aids central nervous system axon regeneration*
November 29	**Astrocytes in disease**	*Glia: A toxic reaction* *Functional diversity of astrocytes in neural circuit regulation*	*Neurotoxic reactive astrocytes are induced by activated microglia*
December 6	**Microglia**	*Neuroinflammation: Surprises from the sanitary engineers* *Microglia emerge as central players in brain disease*	*TAM receptors regulate multiple features of microglial physiology*