

CAMB/INSC 597 – Neural Development, Regeneration and Repair

Wednesday and Friday 10:15 – 11:45 (exceptions in April)

Mandatory Organizational Meeting: Friday January 17th,
Class Location: Steller-Chance Labs (SCL) 0204 (exceptions in April CRB 205)

Course Directors:

Greg Bashaw (gbashaw@penmedicine.upenn.edu)
Yuanquan Song (songy2@chop.edu)

Additional Instructors:

Sandra Maday (smaday@penmedicine.upenn.edu)
Jonathan Raper (raperj@penmedicine.upenn.edu)
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Isaac Chen (isaac.chen@penmedicine.upenn.edu)

General Description: The goals of this course are to examine the principles underlying nervous system development and to learn how understanding developmental mechanisms can inform strategies to promote regeneration and repair. **This is not a survey course.** Rather, the course will focus on selected topics, for which we will discuss the genetic, molecular and cellular strategies employed to study these problems in different model organisms. Emphasis is on how to interpret and critically evaluate experimental data.

Spring 2025 Topics: Neural Diversity; Autophagy in Neurodevelopment and Neurodegeneration; Axon Degeneration and Regeneration; Wiring in the Olfactory Nervous System; Regeneration in the Retina; Dendrite Morphogenesis and Self Avoidance; Synaptogenesis; Organoid models.

Textbooks: No specific textbooks are required. The following texts are useful resources. *Developmental Biology* by Scott Gilbert; *Development of the Nervous System* by Sanes, Reh, and Harris; and *Molecular and Cellular Approaches to Neural Development* edited by Cowan, Jessell, and Zipursky.

Format: Each class is 1.5 hours in length. During the first hour, an assigned paper will be discussed in detail. During the last 20-30 minutes, faculty will introduce methods, concepts, and background information pertinent to the paper that will be discussed at the following meeting.

While faculty will provide guidance during the discussion, students will be primarily responsible for presenting and discussing the papers. So that every

participant can contribute thoughtfully to the discussion, you should come prepared to answer these questions:

- 1) What was the main finding of the paper (2 sentences)?
- 2) What experiment produces the authors' most convincing data?
- 3) What experiment is the least convincing or weakest? Why?
- 4) What hypothesis derived from this paper would you set out to test next, and how (3-4 sentences)?

You will submit written answers to these questions at the beginning of each class (**please email your answers to the faculty by 10:00am of the class date or submit a printout at the class**) - so do not try to read the paper just before class. We use these write-ups to help facilitate discussion.

Grading: A) Participation in paper presentation and discussion: 70%. During the semester, you may receive informal feedback on your participation by e-mail. Please also feel free to email the faculty for your questions, thoughts, suggestion, and feedbacks. B) One 2-page research type proposals, 30%. The proposal will be on a topic of your choice that has already been discussed in the course. The student will first develop a hypothesis and present it to receive feedback from the peers and course directors. The student will then write the proposal, and the course directors will give written feedback. Guidelines on the proposal as well as some examples will be posted on the Blackboard.

Course Web page: This course will use Penn's Canvas website. Papers, reviews and lecture notes will be posted in the Modules section.

Syllabus: Neural Development, Regeneration and Repair (Spring 2025)

Date	Topic	Faculty	Second Faculty
Fri 1/17	ORGANIZATIONAL MEETING Introduction to first paper	Greg Bashaw Yuanquan Song	All faculty
Wed 1/22 Fri 1/24 Wed 1/29	Neural Diversity	Greg Bashaw	Yuanquan Song
Fri 1/31 Wed 2/5 Fri 2/7	Autophagy in Neurodevelopment and Neurodegeneration	Sandra Maday	Yuanquan Song
Wed 2/12 Fri 2/14 Wed 2/19	Axon Degeneration and Regeneration	Yuanquan Song	Greg Bashaw
Fri 2/21 Wed 2/26 Fri 2/28	Olfactory Wiring	Jonathan Raper	Greg Bashaw

Wed 3/5	Proposal Writing	Greg Bashaw Yuanquan Song	
Fri 3/7	No Class		
Wed 3/12	Intro to Regeneration in the Retina	Katherine Uyhazi	Yuanquan Song
Fri 3/14 Wed 3/19	Regeneration in the Retina	Katherine Uyhazi	Yuanquan Song
Fri 3/21	No Class		
Wed 3/26	Regeneration in the Retina	Katherine Uyhazi	Yuanquan Song
Fri 3/28 Wed 4/2 Fri 4/4	Dendrite Morphogenesis and Self Avoidance	Greg Bashaw	Yuanquan Song
Wed 4/9 Fri 4/11 Wed 4/16	Synaptogenesis	Michael Hart	Greg Bashaw
Fri 4/18	No Class		
Tue 4/22 Thu 4/24 Tue 4/29	Organoids (CRB 205)	Isaac Chen	Yuanquan Song
Written proposal due 5/9, critiques back by 5/20			Greg Bashaw Yuanquan Song