

NEUROBIOLOGY COURSE SYLLABUS 2026 June 1, 2026– July 11, 2026

Directors:

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Overview:

The foundations underlying neuronal function is a common theme throughout the Neurobiology Course. Students will become versed in electrophysiology, optogenetic manipulation of neural circuitry and modern approaches toward understanding brain circuitry and advanced synaptic function. The course is organized in two experimental sections described below. During these sections students will have morning lectures (unless noted) and afternoon hands-on training in different techniques. Students working in small groups will work in different projects designed by students and faculty.

Ion channels and Circuits Physiology (ICCP) June 2 – June 19

Section head: Ricardo C. Araneda (University of Maryland)

Section Description: Our most fundamental knowledge of neuronal function is based on electrophysiological techniques. In this section students will learn the basic principles that underlie the membrane potential of neurons, ion channel function, including gating and permeation, and the techniques used in their study. We will review basic concepts of whole-cell recordings, including voltage- and current-clamp, and extracellular recordings. In addition, we will review signal transduction in neurons and sensory transduction, and synaptic transmission.

Daily Schedule (some exceptions noted below)

9:00 – 11:00: Lecture (All students must be present for the lecture to start)

11:00 – 1:30 pm: Lunch/ Free time

1:30 – 6:00 pm: Lab

6:00 – 7:00 pm: Dinner/Free time

7:00 pm – evening: Lab and/or evening seminars (at 8:00pm)

Wed June 3	9am – 11:00	Lecture: Ana – Voltage-clamp
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Short Rotations in Each rig
	5:00 – 6:00pm	Open lab office hours
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Short Rotations in Each rig

Thurs June 4	9am – 11:00	Lecture: Andres – Electrophysiological correlates of gating and permeation in ion channels
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Short Rotations in Each rig
	6:00 – 7:00pm	Dinner and Free Time
	7:00pm – Midnight	Jar of Destiny / Groups assemble

Fri June 5	9am – 11:00	Lecture: Andres/Ana – Structural basis of ion channel function
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Lab projects
Sat June 6	9am – 12:00	Lab Projects
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 4:00pm	Lab Projects
	4:00 – 6:00pm	Social activities
	6:00 – 7:30pm	Dinner and Free Time thereafter
Sun June 7	DAY OFF	
Mon June 8	9am – 11:00	Lecture: Ricardo– Current clamp
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	8:00 – 9:30pm	Monday Night Lecture: Title: “ <i>A gut sense</i> ” Maya Kaelberer, University of Arizona
Tue June 9	9am – 11:30	Lecture: Mike – Presynaptic mechanisms
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free time
	7:30pm – Midnight	Lab projects
Wed June 10	9am – 11:00	Lecture: Joe – Electrophysiology data analysis
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Lab projects
Thurs June 11	9am – 11:00	Lecture: Tim – Synaptic Transmission: postsynaptic
	12:00 – 1:30pm	PIZZA DATA BLITZ (Meigs dining room, Swope)
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Lab projects
Fri June 12	9am – 11:00	Lecture: Maya Kaelberer – Molecular mechanisms of sensory transduction. (different modalities, intracellular)
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Lab projects
Sat June 13	9am – 12:00	Lab Projects-Data analysis
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 4:00pm	Lab Projects-Data analysis
	4:00 – 6:00pm	Social activities
	6:00 – 7:30pm	Dinner and Free Time thereafter

Sun June 14	DAY OFF	
Mon June 15	9am – 11:30 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 8:00 – 9:30pm	Lecture: Joe/Ricardo – Olfactory circuits Lunch with Diana Bautista Lab Projects Dinner and Free Time Monday Night Lecture: <i>“The role of Scn1b in mechanosensory signaling and behavior”</i> Diana Bautista, UC Berkeley, The Ed Kravitz Endowed Lectureship in Neurobiology
Tue June 16	9am – 11:00 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Lecture: Corey- Fantastic Ion Channels and where to find them Lunch and Free Time Lab Projects Dinner and Free Time Lab projects
Wed June 17	9am – 11:00 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Review session (Maya & Joe) PIZZA DATA BLITZ (Meigs dining room, Swope) Lab Projects Dinner and Free Time Lab projects
Thurs June 18	9am – 11:00 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Ethics and the work environment (Faculty Panel) Lunch and Free Time Data analysis Dinner and Free Time Data analysis
Fri June 19	9am – 11:00 12:00 – 1:30pm 1:30 – 4:00pm 6:30pm – Midnight	Presentation Preparation Lunch and Free Time Project Presentations END OF CYCLE PARTY
Sat June 20	DAY OFF	
Sun June 21	DAY OFF	

Imaging Neural Function from Synapses to Circuits June 22- July 12

Section head: Mike Hoppa (Dartmouth College)

Section Description: The objective of this section is to introduce the students to cutting-edge molecular approaches in neurobiology, this year the course will focus on molecular techniques with optical/microscopic readouts of neural function. Experimentally, we will be exploring basic processes of synaptic biology, neural metabolism, organelle function and neural plasticity using a host of techniques. A focus will be on microscopy and we will deploy fluorescent techniques including structured illumination, 2-Photon illumination, STORM, light sheet microscopy, voltage imaging and in vivo readouts of cellular physiology as well as electron

microscopy. A detailed understanding of these cellular phenomena may lead to new insight into neurological disease characterized by unstable or altered function of neural circuits including intellectual disabilities, neural degeneration and epilepsy.

Daily Schedule (some exceptions noted below)

9:00 – 11:00: Lecture (All students must be present for the lecture to start)

11:00 – 1:30 pm: Lunch/ Free time

1:30 – 6:00 pm: Lab

6:00 – 7:00 pm: Dinner/Free time

7:00 pm – evening: Lab and/or evening seminars (at 8:00pm, Monday and Friday night lectures)

Mon June 22	9:00 – 11:30am 11:30am 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 8:00 – 9:30pm	Lecture: Fluorescent Microscopy part 1 - Darcy Peterka Mini Presentations (5 mins per team White Board) Lunch with Samuel Young Rotations including Practicals Dinner and Free Time Monday Night Lecture: Samuel Young, UNC, The Thomas Sargent Reese Endowed Lecture in Neurobiology
Tue June 23	9:00 – 11:30am 12:00 – 1:00pm 1:30 – 6:00 6:00 – 7:30pm 7:30pm	Lecture: Fluorescent Microscopy part 2 - Darcy Peterka Lunch and Free Time Rotations including Practicals Dinner and Free Time Jar of Destiny
Wed June 24	9am – 11:30 12:00 – 1:30pm 1:30 – 5:00pm 6:00 – 8:00pm	Lab Project, no lecture Lunch Lab Projects Falmouth Commodores home game!
Thurs June 25	9am – 11:30 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	lecture: resolution in microscopy and molecular regulation of connectivity - Erik Jorgensen Lunch and Free Time Lab Projects Dinner and Free Time Practicals on Microscopy II
Fri June 26.	9am – 11:30 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Lecture: Lecture: A History of Electron Microscopy and its Future Mark Terisaki Lunch and Free Time Lab Projects Dinner and Free Time Lab Projects
Sat June 27	10am – 12:00pm 12:00 – 1:30pm 1:30pm - 3:00pm 5:00 – 7:30pm 7:30pm – Midnight	Rig Meetings / Lab Projects – (TBD by project head) Lunch and Free Time <i>Softball Game with NSB</i> Dinner and Free Time Lab Projects – (TBD by project head)
Sun June 28	DAY OFF	
Mon June 29	9am – 11:00	Lecture: Optogenetics, History of Discovery, Actuators, and Indicators - Ahmed Abdelfattah

	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	8:00 – 9:30pm	Monday Night Lecture: Ed Boyden, MIT, The Ruth Sager Endowed Lecture in Neurobiology
Tue June 30	9am – 11:00	Lecture: Optical Dissection of Sensori– Motor Circuits - Tianyi Mao
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	8:00 – 9:30pm	Lab projects
Wed Jul 1	9:30 – 11:30am	Lab Project, no lecture
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Float Brain Storming
Thurs Jul 2	9:00am-noon	Lecture: Circuit Dynamics of Spatial and Contextual Learning in the Hippocampus and Entorhinal Cortex - Jayeeta Basu
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	8:00 – 9:30pm	Lab projects
Fri July 3	9:00 – 11:30am	Lecture: In Vivo Imaging - Haining Zhong
	12:00 – 1:30pm	Lunch and Free Time
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Float Construction
Sat July 4	10am – 12:00pm	Prepare for Parade
	12:00 – 1:30pm	Parade
	5:00pm	BBQ
Sun July 5	DAY OFF	
Mon July 6	9:00 – 11:30am	Lecture: Decoding Synapses with Fluorescent Lifetime Ryohei Yasuda
	12:00 – 1:30pm	Lunch with Amy Lee
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	8:00 – 9:30pm	Monday Night Lecture: Amy Lee, UT Austin
Tue July 7	9:00 – 11:30am	Lecture: Axons, Development vs Regeneration- Lauren Walker
	12:00 – 1:30pm	Lunch with Amy Lee
	1:30 – 6:00pm	Lab Projects
	6:00 – 7:30pm	Dinner and Free Time
	7:30pm – Midnight	Lab projects

Wed July 8	9:00 – 11:30am 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Lecture: Perturb and watch the brain in action: Toward the physical basis of learning and memory Lin Lin Fan Lunch Lab Projects Dinner and Free Time Free Time
Thurs July 9	9am – 11:30AM 12:00 – 1:30pm 1:30 – 6:00pm 6:00 – 7:30pm 7:30pm – Midnight	Lecture: From Light to Circuit Function: Mechanisms of Visual Processing - Juan Angueyra Lunch and Free Time Data analysis (Rigs are taken down before evening) Dinner and Free Time Data analysis and Presentation Preparation
Fri July 10	9:30am – 10:30 11:00 - 1:00pm 1:00pm – Midnight	Lecture Where do we go from here? Lunch FINAL PRESENTATIONS PREPARATION
Sat July 11	9am-12pm 1:00-3:00pm 3-6pm 6:00pm	Final Presentations ALL STUDENTS FINAL LAB CLEAN UP Free Time MBL CLUB END OF COURSE PARTY