Molecular Mechanisms of Memory

Professor Tom Carew

GOALS, STRUCTURE AND EVALUATION

GOALS

The goals of the course are threefold:

- Gain a basic understanding of the molecular approaches used in the analysis of learning and memory
- Learn to critically evaluate and present original literature in the field
- Learn to work as a member of a team in preparing and presenting Project Proposals

STRUCTURE

The course will be focused on three powerful model systems that have provided seminal insights into the molecular architecture of learning and memory: (i) *Aplysia*, (ii) *Drosophila*, and (iii) the Hippocampus.

In the first part of the course (Classes 1-4), I will provide lectures giving the background and fundamentals for each of the model systems. The second part of the course (Classes 5-13) will be comprised of three "cycles" (an *Aplysia* cycle, a *Drosophila* cycle, and a Hippocampal cycle). Each cycle will have three parts (each taking one day of class time):

- The first day will consist of student-led discussions of original literature (which I will provide; typically three papers per class). All students will be responsible for all papers. Students will take turns discussing the major findings of each paper, followed by a general discussion of the combined papers by the whole class.

- For the second and third days of each cycle, students will be divided into teams (roughly 4 students per team). The ultimate goal of each team is to (i) take what was discussed in the original literature sections, coupled with my lectures and any other material each team chooses, and (ii) develop a Project Proposal describing in as much detail as possible the next experimental steps each team would take to advance the field, using the model system for that cycle. Towards that end:

    - The second day of each cycle will be a brainstorming session in class, wherein each team will cluster together and plan their Project Proposal. I will circulate among the teams throughout the session to answer questions and facilitate discussions.

    - The third day of each cycle will be the presentation of each team's Project Proposal, followed by a general discussion of all the proposals.

- Two final points: (i) The composition of the teams will change for each cycle, and (ii) I will provide popcorn during all team presentations.

FINAL EXAM

There will be only one exam in the course. It will be a take-home exam consisting of 2-3 questions. Students will answer only one question of their choosing. The exam answer can be no longer than 5 pages (double spaced, Arial 11 font). The exam will be posted on the class website on the morning of Tuesday during exam week. Your answer must be returned to me (by email) no later than 5 pm on Thursday of that week.

EVALUATION

The majority of a student's grade (80%) will be determined by three factors: (i) preparation for class, (ii) engagement and participation in discussions, and (iii) the quality of oral presentations (e.g., on Days 1 and 3 of each cycle). In addition, the final exam will contribute 20% to a student's final grade.

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2017 CLASS SCHEDULE

Sept 11	(1) Course goals and structure; (2) Learning and Memory: an Overview
	(3) Introduction to the molecular vocabulary of learning and memory
Sept 18	**Model System I**: Synaptic and molecular analysis of memory in *Aplysia*
Sept 25	**Model System II**: Behavioral genetic analysis of memory in *Drosophila*
Oct 2	**Model System III**: Long-term synaptic plasticity in the hippocampus

CYCLE 1: *APLYSIA*

Oct 9	Fall Break
Oct 16	***APLYSIA* I**: Student-led discussions of original papers
Oct 23	***APLYSIA* II**: Breakout sessions - team brainstorming for Project Proposals
Oct 30	***APLYSIA* III**: Team presentations of Project Proposals

CYCLE 2: *DROSOPHILA*

Nov 6	***DROSOPHILA* I**: Student-led discussions of original papers

Nov 13 **No Class:** (SfN Meeting)

Nov 20 **DROSOPHILA II**: Breakout sessions - team brainstorming for Project Proposals

Nov 27 ***DROSOPHILA* III**: Team presentations of Project Proposals

CYCLE 3: HIPPOCAMPUS

Dec 4 **HIPPOCAMPUS I**: Student-led discussions of original papers

Dec 11 **HIPPOCAMPUS II**: Breakout sessions - team brainstorming for Project Proposals

Dec 19 **HIPPOCAMPUS III**: Team presentations of Project Proposals