MCB133: Unique Cells and Organisms,
Harvard University
Tuesday and Thursday, 9AM EST

Course Instructor: Nicholas Bellono, nbellono@harvard.edu

Schedule: Class will meet Tuesday and Thursday at 9AM. This is an interactive discussion-based course and attendance will be expected. Offline discussion of experimental analyses will be encouraged.

Office hour: By appointment.

Course description:
This course focuses on how specialized molecular physiology gives rise to unique features across interesting organelles, cells and creatures. Students will design a research project based on their selection of a model organism, virtually carry out an initial experiment, analyze results, and plan future directions. Guest lecturers and instructors will emphasize primary literature and scientific writing to strengthen students' skills in critical thinking, interpretation of data, and experimental design. Students will end their semester by developing a research proposal and presentation based on their own curiosity in an interesting biological question emerging from their initial experiments.

Model organisms: Sea star (*Asterias vulgaris*), moss (*Physcomitrella patens*), nudibranch (*Berghia Stephanieae*), sea anemone (*Aiptasia*), likely others

Assignments:
- Reading reflections: Briefly answer questions (2-3 sentences) each class to prepare for discussion weekly questions about research topics
- News and Views: 800 - 1000 word essay about primary literature in the context of the field
- How to write an abstract: <200 words to summarize an original research article
- Paper critique: Critique primary literature, emphasizing its significance, strengths and weaknesses
- Experimental design: Select a model organism and design an experiment, present this experiment to the class for critique. We will carry out your finalized experiment and provide you results for analysis
- Research proposal: 10 min presentation, written proposal based on initial experiments, and peer review
- Participation: Students are expected to participate in discussion, presentation of figures from papers, and ask questions during others' presentations.

Grading: Reading reflections 10%, participation 20%, writing assignments 50%, Peer reviews 10%, presentation 10%

Canvas: Details regarding all assignments, reading, and course information can be found on Canvas. Handouts and book chapters covering basic ion channel concepts are also posted in Canvas.

Accommodations for students with disabilities:
Students needing academic adjustments or accommodations because of a documented disability must present their Faculty Letter from the Accessible Education Office (AEO) and speak with the course instructor by the end of the second week of the term. Failure to do so may result in the Course Head's inability to respond in a timely manner. All discussions will remain confidential, although Faculty are invited to contact AEO to discuss appropriate implementation.

Academic integrity policy:
You are encouraged to discuss all assignments with classmates and others, but assignments should be your own writing and reflect your thought process. Refer to the specific assignment instructions for more detail. In all work you hand in for class, use citations as you would for any published documents: http://lifesciences.fas.harvard.edu/files/lifesci/files/guide_to_citing_in_the_life_sciences.pdf?m=1411135909

Schedule: Associated readings and more detail listed in Canvas

Week	Date	Date	Topic	Activity
ion channels as a model for understanding specialization across proteins, cells, and organisms	Week 1	9/3	Intro / electroreception	Lecture: Introduction
	Week 2	9/8	Ion channels	Review of concepts
		9/10	Ion channels	Review of concepts
	Week 3	9/15	Relationship between ion channel structure and function	Discuss paper, how techniques drive discovery
		9/17	Experimental design	Lecture / Discussion: "Experimental design: planning your science"
	Week 4	9/22	Ion channels as molecular handles for understanding physiological systems	Lecture: "Sensory receptors - from identification to function"
		9/24	How to present science	Lecture / Discussion: "How a specific finding influences other fields of study"
	Week 5	9/29	Scientific discovery	Guest lecture: Anita Zimmerman
Unique organisms		10/1	Interspecies interactions	Guest lecture: Patric Vaelli
	Week 6	10/6	Organismal state influences cellular signaling	Review paper and provide comments
		10/8	Experimental jousting	Present and critique initial experiment
	Week 7	10/13	Experimental jousting	
		10/15	Experimental jousting	
	Week 8	10/20	Adaptations in visual predators	Guest lecture: Mike Do
Unique cells		10/22	Electrical signals in nonexcitable cells	Lecture: “Electrical signals in excitable vs nonexcitable cells” Discuss paper, abstract
	Week 9	10/27	Mitochondrial ion channels	Guest lecture: Ambre Bertholet
		10/29	Analysis and interpretation	Brainstorming session - how you analyzed data and what are your interpretations
	Week 10	11/3	Integration of cellular signals	Lecture: "Molecular basis of sea anemone and jellyfish stinging"
		11/5	Electrical regulation of fertilization	Lecture: "Experimental hurdles to the study of electrical regulation of fertilization" Discuss papers
	Week 11	11/10	Electrical regulation of pigmentation	Lecture: "Ion channels in organelle function"
Experimental design		11/12	Peer review	Peer review proposals in panels
	Week 12	11/17	Peer review	
		11/19	Presentations	Proposal Presentations and Feedback
	Week 13	11/24	Presentations	
		11/26	Thanksgiving	
		12/1	Presentations	
Final				Final proposal due