Harvard College | Neuro101O | Fall-Spring 2020-21

Prerequisites: MCB/Neuro 80, or permission from the instructor

Food for hungry minds

The neural basis of feeding behavior

When & where?

Thursdays
4:30-5:45 pm Eastern Time

Course Page

https://canvas.harvard.edu/courses/93398

Instructors

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He/ him/ his

Through the course you will develop:

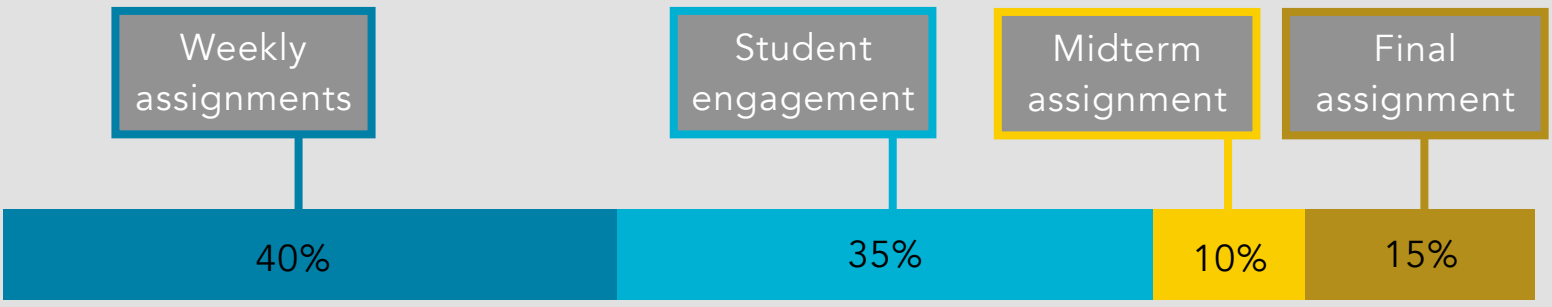
The capacity to...

- Read, summarize, present, and critically assess primary research.
- Explain the findings and narrative of scientific research using language targeted to specific audiences.
- Build on existing findings by suggesting follow-up research directions and experimental approaches to address them.
- Explore scientific literature independently.

Your knowledge of...

- Major neuronal cell types and circuitry that control feeding in mammals, and the factors they integrate to guide behavior.
- How feeding is regulated in different species according to their ecological niche.
- How body state, genetic factors, and environmental influences contribute to the control of feeding behavior.
- Experimental techniques used to explore the regulation of feeding behaviors at different levels, from genetics, to neural circuits, to behavioral ecology.

You will be graded on:

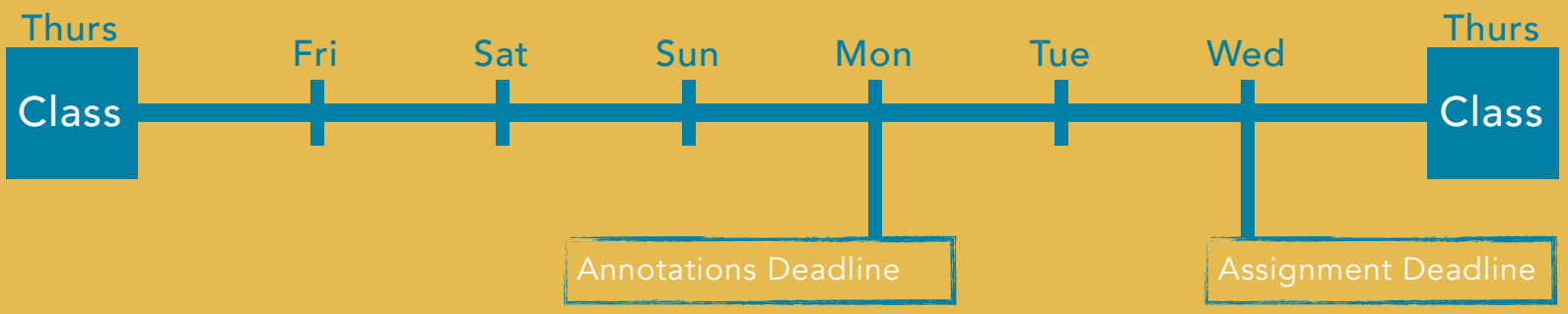


More information on grading can be found in a Grading Policies document within the "Files" section of the course website.

Course Components

Our weeks will have this structure:

- Each class will last 75 minutes
- We expect you to need 4-6 hours of work outside the class

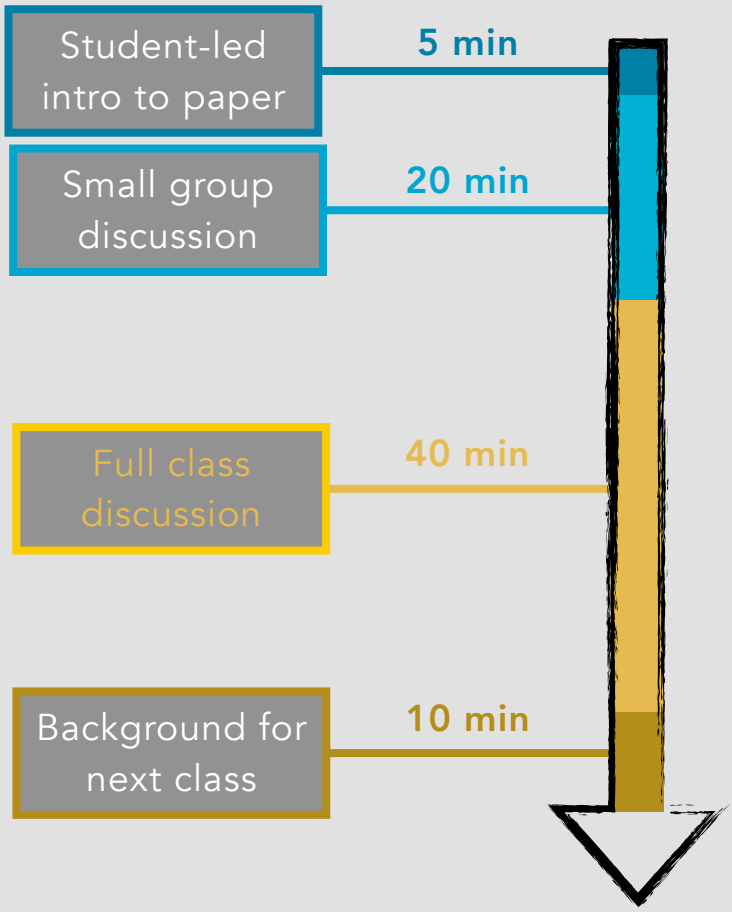


Student drop-ins

Wednesdays 2pm-3pm

- These are scheduled time-slots for us to chat.
- We strongly encourage you to come to at least one student drop-in slot per semester.
- Please feel free to drop in at any point - we really enjoy talking to students.
- This is your time, so you can use it however you want! Stop by for a quick chat, ask questions about the course, any reason is a good reason.
- The class will decide together on a schedule that works best for most students. We will also provide extra slots each week in case the scheduled slot doesn't work for you.

A typical class:



To maximize your engagement in our weekly small group and full class discussions, please make sure to read the assigned paper and submit your homework (see next page for details) before each class.

Course Components

Your weekly homework has two parts:

Group annotations (due Mondays, 11:59pm)

Each week, you will be assigned a specific primary research paper (or, later in the course, review article) to read. To help you through this reading and thinking, you will participate in online annotations of the assigned paper during the week. This will be done via Perusall, in a collaborative class document on the course website.

Rotating weekly assignments (due Wednesdays, 11:59pm)

You will complete one of the following assignments, which will help you develop key skills in summarizing and communicating research findings, exploring research literature, and thinking creatively about new research directions (additional details will be given in class):

- **What's the Story?:** Find the key components that structure the narrative of the paper.
- **One Concept, Three Audiences:** Summarize the paper's findings for 3 different audiences: a 7-year-old, a college classmate, and an expert.
- **Lab Note:** Short written summary of the paper for a general audience.
- **Reflection:** Share your thoughts on the paper in a free-form structure.
- **Abstract:** Write an abstract for the assigned paper (without reading the original abstract).
- **Next Question:** Formulate one question you would investigate based on the assigned paper, describing up to two follow-up experiments.
- **Pick a Paper, Tell a Story:** Choose one paper referenced in the assigned review article, summarize it as in "*What's the Story?*" assignment, and present it to the class.

Midterm assignment

You will use all the skills you've developed this semester to write a 1-2 page article for a general audience, exploring a particular topic by integrating at least two of the scientific papers we have covered over the semester.

Final assignment

You will write an article that explores a topic of your choice inspired by the course syllabus, integrating concepts from at least three papers you discover yourself, and suggesting directions for future research. You will also present this topic to the class.

The weekly assignments will help you to develop skills that you will use for the Midterm and Final assignments. We will provide feedback on your weekly assignments, and you will receive full credit as long as you complete the assignment, and incorporate this feedback in future assignments.

Course Policies

The classroom environment

We are so excited to welcome you to the classroom! Feeling comfortable to formulate questions and to communicate with us and with your classmates is crucial for us all to learn and grow throughout the course. Together, we will create an inclusive space rooted in mutual support, where diverse ideas are welcomed and where we expect that everyone will be committed to thoughtfully listen and respectfully engage in discussions.

Participation and deadline buffers

To get the most out of the course, we hope that you will be motivated to join all of the classes, and to submit the assignments on time. However, we do understand that **you may not always be able to do so**. We ask that you let us know as soon as you can if you are struggling, or if circumstances may prevent you from attending class(es) or meeting deadline(s). Please don't hesitate to contact us, we will work with you to find a solution that accommodates your circumstances while helping you to keep up with the course. As a further buffer, you will have **one 'Free Pass' per semester** on the homework assignments, with no questions asked. Beyond this, if you are absent or miss a deadline and don't contact us at all, we may give zero credit for that class/assignment.

Academic integrity and collaboration

As a student you are responsible for understanding, and expected to follow Harvard College academic integrity policies: https://handbook.fas.harvard.edu/book/academic-integrity. We strongly encourage you to discuss course material, as well as exchange questions, ideas and resources with your colleagues outside of class. Doing so will improve your learning experience and foster an environment where all can contribute and thrive. However, we also expect that the assignments and homework that you submit are a product of your independent research and writing. You must acknowledge the contribution of anyone who assists you (e.g. feedback on your drafts) and cite sources used in your assignments such as articles, books, lectures, websites, etc.

Accommodations for students with disabilities

We are committed to creating a course that is accessible to all students. If you need academic adjustments or accommodations, we ask for your Letter from the Accessible Education Office (AEO, http://aeo.fas.harvard.edu) and that you speak with the instructors by the end of the second week of the term, to make sure we can respond to your needs in a timely manner. All discussions will remain confidential, although consultation with AEO may be necessary for appropriate implementation.

Course Schedule

Fall Semester

Week	Class topic	Pre-Class Homework
	Let's get started	
Course Preview 8/20/2021	**Course preview**	**N/A**
Week 1 9/2/2021	**Introduction**	**N/A**
	Wired up to eat	
Week 2 9/9/2021	**Neural circuitry of hunger and satiety**	**Read:** Aponte et al., 2011 **Write:** What's the story?
Week 3 9/16/2021	**Homeostatic and hedonic feeding**	**Read:** Tellez et al., 2016 **Write:** One concept, three audiences
Week 4 9/23/2021	**Timescales of appetite regulation**	**Read:** Campos et al., 2016 **Write:** Reflection
	What's on the menu?	
Week 5 9/30/2021	**Sensory systems that contribute to flavor**	**Read:** Oh et al., 2021 **Write:** What's the story?
Week 6 10/7/2021	**Remembering what not to eat**	**Read:** Chen et al., 2018 **Write:** Abstract
Week 7 10/14/2021	**I don't like that!**	**Read:** Royet et al., 2016 **Write:** One concept, three audiences
Week 8 10/21/2021	**Evolution of food preference**	**Read:** McBride et al., 2014 **Write:** Lab note
Week 9 10/28/2021	**I should have chosen something else**	**Read:** Steiner and Redish, 2014 **Write:** Reflection
	There's no brain without a body	
Week 10 11/4/2021	**Gut-to-brain satiation signaling**	**Read:** Goldstein et al., 2021 **Write:** Lab note
Week 11 11/11/2021	**Hormonal regulation of feeding (part1)**	**Read:** Gabery et al., 2020 **Write:** What's the story?
Week 12 11/18/2021	**Hormonal regulation of feeding (part2)**	**Read:** Wilding et al., 2021 **Write:** Next question
Week 13 11/25/2021	No Class (Thanksgiving Break)	
Week 14 12/2/2021	**Predicting future bodily states**	**Read:** Livneh et al., 2020 **Write:** Lab note
12/8/2021	**Midterm assignment due by 11:59pm Eastern Standard Time**	

Note: The schedule, assigned readings, and assignments are subject to change. We will notify you of any changes at least one week in advance.

Course Schedule

Spring Semester

Week	Class topic	Pre-Class Homework
	Into the wild	
Week 1 1/27/2022	**Preparing for hibernation**	**Read:** Schwartz et al., 2015 **Write:** Next question
Week 2 2/3/2022	**Feeding the colony**	**Read:** Lucas and Sokolowski, 2009 **Write:** One concept, three audiences
Week 3 2/10/2022	**Balancing competing needs**	**Read:** Jourjine et al., 2016 **Write:** Abstract
	Foraging	
Week 4 2/17/2022	**What is foraging**	**Read:** Calhoun and Hayden, 2015 **Write:** Pick a paper, tell a story
Week 5 2/24/2022	**Foraging in the lab**	**Read:** Kolling et al., 2012 **Write:** Lab note
	Nature and nurture	
Week 6 3/3/2022	**Maternal programming of offspring appetite and metabolism**	**Read:** Steculorum and Bouret, 2011 **Write:** Next question
Week 7 3/10/2022	**Trans-generational inheritance of acquired food preference**	**Read:** Moore et al., 2019 **Write:** One concept, three audiences
Week 8 3/17/2022	No Class (Spring recess)	
Week 9 3/24/2022	**Genetics of obesity**	**Read:** Lotta et al., 2019 **Write:** Reflection
	Feeding, health and society	
Week 10 3/31/2022	**Eating disorders**	**Read:** Kaye et al., 2009 **Write:** Pick a paper, tell a story
Week 11 4/7/2022	**Neuromarketing**	**Read:** McClure et al., 2004 **Write:** Abstract
	Let's wrap it up	
Week 11 4/14/2022	**Final assignment presentations**	**N/A**
Week 12 4/21/2022	**Final assignment presentations, class recap & discussion**	**Read:** N/A **Write:** Reflection
4/27/2022	**Final assignment due by 11:59pm Eastern Standard Time**	

Note: The schedule, assigned readings, and assignments are subject to change. We will notify you of any changes at least one week in advance.

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Chen, J.Y., C.A. Campos, B.C. Jarvie, and R.D. Palmiter. 'Parabrachial CGRP Neurons Establish and Sustain Aversive Taste Memories'. Neuron, 2018.

Gabery, S., C.G. Salinas, S.J. Paulsen, J. Ahnfelt-Rønne, T. Alanentalo, A.F. Baquero, S.T. Buckley, et al. 'Semaglutide Lowers Body Weight in Rodents via Distributed Neural Pathways'. *JCI Insight* 5 (2020), p. e133429.

Goldstein, N., A.D. McKnight, J.R.E. Carty, M. Arnold, J.N. Betley, and A.L. Alhadeff. 'Hypothalamic Detection of Macronutrients via Multiple Gut-Brain Pathways'. Cell Metabolism 0 (2021).

Jourjine, N., B.C. Mullaney, K. Mann, and K. Scott. 'Coupled Sensing of Hunger and Thirst Signals Balances Sugar and Water Consumption'. Cell 166 (2016), pp. 855–66.

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Lotta, L.A., J. Mokrosiński, E. Mendes de Oliveira, C. Li, S.J. Sharp, J. Luan, B. Brouwers, et al. 'Human Gain-of-Function MC4R Variants Show Signaling Bias and Protect against Obesity'. Cell 177 (2019), pp. 597-607.e9.

Lucas, C. and M.B. Sokolowski. 'Molecular Basis for Changes in Behavioral State in Ant Social Behaviors'. Proceedings of the National Academy of Sciences 106 (2009), pp. 6351–56.

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Wilding, J.P.H., R.L. Batterham, S. Calanna, M. Davies, L.F. Van Gaal, I. Lingvay, B.M. McGowan, et al. 'Once-Weekly Semaglutide in Adults with Overweight or Obesity'. *New England Journal of Medicine* 384 (2021), pp. 989–1002.

Suggested background reading

This review article is not required reading, but provides a good overview of some of the topics covered in the course, and useful background details for understanding the weekly assigned research papers:

Andermann, M.L. and B.B. Lowell. 'Toward a Wiring Diagram Understanding of Appetite Control'. Neuron 95 (2017), pp. 757–78.