

RECEPTOR BIOLOGY



BIOL 333

Spring 2023

MW 11:15-12:30

MBH 148

COURSE OVERVIEW

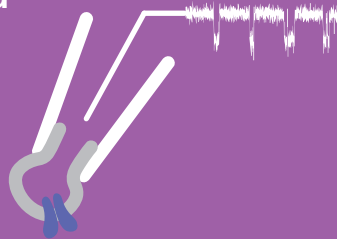
>4%

Over 4% of the protein-coding human genome encodes for a receptor



Receptors enable transmission of information into the cell and represent a major target in the pharmaceutical industry

We'll explore the world of receptors and the interdisciplinary methods used to understand their structure/function



After engaging with the primary literature, we'll emphasize discipline-specific writing and other forms of communication



INSTRUCTOR INFO



Professor: Greg Pask, Ph.D.

Please call me: Greg or Dr./Prof. Pask (he/him)

Ask me about: Anything related to the course, navigating your major, getting started in research, graduate school or other future plans, being a Division III athlete, outdoor spaces in VT, insects, board games, the Marvel Universe, cooking, and building/creating fun stuff.

Preferred Contact: Direct message through Slack

Office Hours: MW 2:00-3:30 or by appointment

Office: MBH 315

Email: gpask@middlebury.edu

Twitter: @G_Pask

COURSE MATERIALS

Slack Workspace: biol333s23.slack.com for all course-related materials and other business

LEARNING OBJECTIVES

At the completion of this course, students will be able to:

Apply knowledge gained from the examined membrane receptor families to comprehend new and unfamiliar receptor types.

Integrate the principles of chemistry, biology, and pharmacology to comprehend ligand-receptor interactions and evaluate its utility in drug discovery and medical treatment.

Evaluate and interpret data from both classical and modern techniques in receptor biology and propose well-designed experiments to investigate receptor structure/function.

Explore the primary literature for significant advances in receptor biology and effectively communicate its merits to different audiences in both oral and written forms.

HOW YOU'LL PROGRESS TOWARD THESE GOALS:



Paper Discussion Reflections



Receptor Competency Problem Sets

CAPSTONE PROJECT



Digital Research Journal



Journal Club Discussions



Scientific Journalism Article

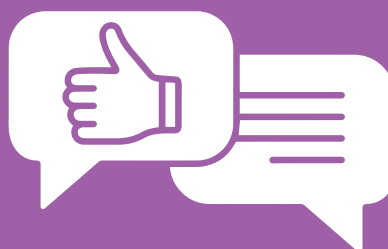


Review Article

HOW I WILL ASSESS YOUR PROGRESS

This course will use a labor-based grading approach that centers on feedback, improvement, integrative thinking, idea development, and effective communication. I strongly believe that traditional assessment practices focus too much on “the grade” and can increase stress and/or decrease risk-taking. Instead, your grade will be based on all the work (learning) you’ll be doing this semester.

If you put in significant effort into an assignment and submit it on time, you get full credit for your work.



Critical feedback is given frequently with a focus on self-improvement.

Larger assignments will involve multiple stages of work spread throughout the semester, and all this effort counts!



I reserve the right to deem any work unacceptable. If the amount of effort is insufficient or it is submitted late, you will not receive any credit for doing it. We will then work to figure out the best practices to optimize your labor-based learning.

EXPECTATIONS



BE ENGAGED



BE CURIOUS



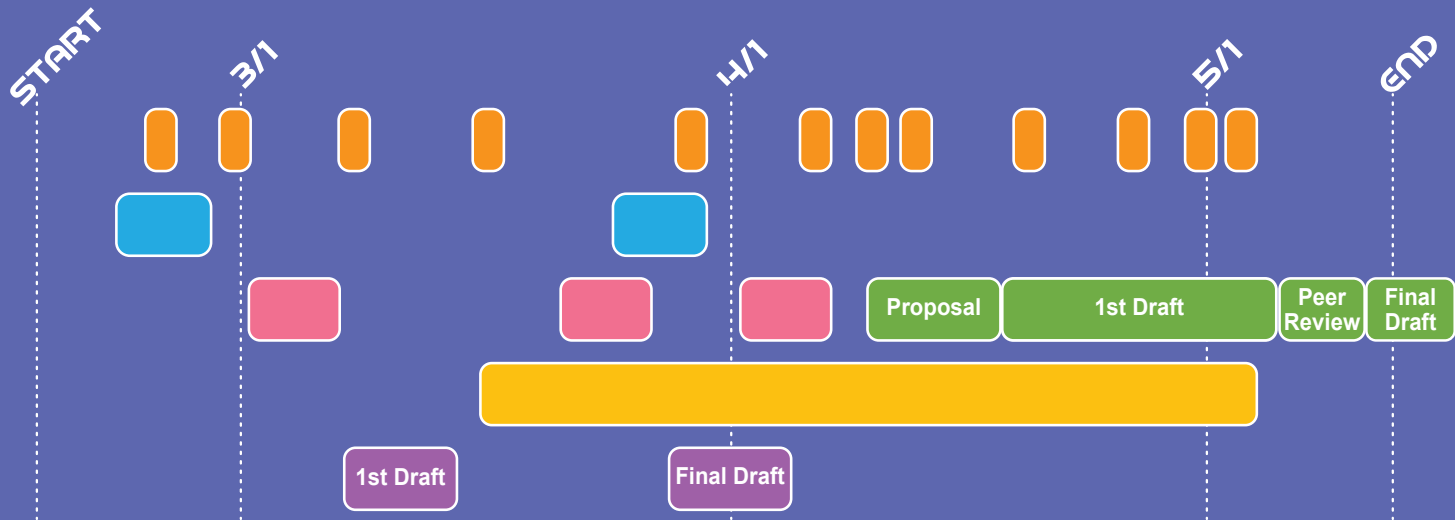
WORK HARD

ACADEMIC INTEGRITY



I believe that Academic Honesty and Integrity is of the utmost importance, so the language from the Honor Code in the Middlebury Handbook (section B.1.a.) resonates with my values. Please include the Honor Code Pledge (“I have neither given nor received unauthorized aid on this assignment.”) on all assignments for this course. If you are unsure of whether a specific action in this course would violate the Academic Honesty Policy in this course, I urge you to check with me beforehand. Any suspected instances of the Academic Honesty Policy will be brought to the attention of the judicial affairs officer.

ASSIGNMENT TIMELINE



Please see the most recent Course Schedule on our Slack Workspace for exact due dates. All work must be submitted before or on the due date.

YOU'VE RECEIVED 3 FLEXIBILITY TOKENS!



You can spend one of these to:

- receive a 48-hour extension on an assignment
- resubmit an assignment that did not earn credit

COURSE ASSIGNMENTS AND GRADE EARNED

				TOTAL POINTS	GRADE
Review Article 120 pts proposal 10 pts 1st draft 50 pts peer review 10 pts final draft 50 pts	Paper Discussion Reflections 60 pts 12 reflections @ 5 pts each	Scientific Journalism Article 60 pts 1st draft 30 pts final draft 30 pts	Receptor Competency Problem Sets 50 pts 2 problem sets @ 25 pts each	460-494	A
	Digital Research Journals 60 pts 3 checks @ 20 pts each		Journal Club Discussion 50 pts	380-394	C+
				361-379	C
			346-360	C-	
			296-345	D	
			≤295	F	

DISABILITY ACCESS/ACCOMODATION

Students who have Letters of Accommodation in this class are encouraged to contact me as early in the semester as possible to ensure that such accommodations are implemented in a timely fashion. For those without Letters of Accommodation, assistance is available to eligible students through the Disability Resource Center (formerly called Student Accessibility Services). Please contact the ADA Coordinators Jodi Litchfield (litchfie@middlebury.edu, 802-443-5936) or Peter Ploegman (pploegman@middlebury.edu, 802-443-2382) for more information. All discussions will remain confidential.

Many thanks to my former students for helpful suggestions on how to improve this course and David Aja's Hawkeye for graphical inspiration.

Course Schedule

Date		Topic	Paper Discussion	Assignment Due
2/13	M	Course intro and overview of receptor/channel families		Listen to "Making the Grade" Podcast Join Slack Workspace
2/15	W	Receptor Basics <i>Biological Membrane Physiology</i>		Receptor Draft prep
2/20	M	Receptor Basics <i>Ionotropic vs. Metabotropic receptors</i>		
2/22	W	Receptor Basics <i>Ligand-Receptor Interactions</i>	Sato-Akuhara et al. "Ligand Specificity and Evolution of Mammalian Musk Odor Receptors: Effect of Single Receptor Deletion on Odor Detection" <i>Journal of Neuroscience</i> 2016	Paper Discussion Reflection #1 due 2/23
2/27	M	Methods in receptor research <i>Expression and Molecular Techniques</i> and <i>Writing to non-experts workshop</i>		Problem Set #1
3/1	W	Methods in receptor research <i>Expression and Molecular Techniques II</i>	Bohlen et al. "A Bivalent Tarantula Toxin Activates the Capsaicin Receptor, TRPV1, by Targeting the Outer Pore Domain" <i>Cell</i> 2010	Paper Discussion Reflection #2 due 3/2
3/6	M	Methods in receptor research <i>Ligand binding/efficacy assays</i>		Digital Research Journal Check #1
3/8	W	Leading a Journal Club Workshop	Caterina et al. "The capsaicin receptor: a heat-activated ion channel in the pain pathway" <i>Nature</i> 1997	Paper Discussion Reflection #3 due 3/9
3/13	M	Methods in receptor research <i>Electrophysiology</i>		Scientific Journalism Article First Draft
3/15	W	Journal Club 1	Read Journal Club Papers	Paper Discussion Reflection #4 due 3/16
3/20-3/24		Spring Break – no class		
3/27	M	Methods in receptor research <i>Structural Biology</i>		Digital Research Journal Check #2
3/29	W	Journal Club 2	Read Journal Club Papers	Paper Discussion Reflection #5 due 3/30 Problem Set #2
4/3	M	Review Article Discussion and Workshop	Carli et al. "Dopamine D2 Receptors Dimers: How can we Pharmacologically Target Them?" <i>Current Neuropharmacology</i> 2018	Scientific Journalism Article Final Draft

4/5	W	Journal Club 3	Read Journal Club Papers	Digital Research Journal Check #3 Paper Discussion Reflection #6 due 4/6
4/10	M	Methods in receptor research <i>Structural Biology II</i>	Rasmussen et al. "Crystal structure of the β 2 adrenergic receptor-Gs protein complex." <i>Nature</i> 2011	Paper Discussion Reflection #7 due 4/11
4/12	W	Journal Club 4	Read Journal Club Papers	Paper Discussion Reflection #8 due 4/13
4/17	M	Neurotransmitter receptors		Review Article Proposal Meeting deadline
4/19	W	Journal Club 5	Read Journal Club Papers	Paper Discussion Reflection #10 due 4/20
4/24	M	Sensory Receptors		
4/26	W	Journal Club 6	Read Journal Club Papers	Paper Discussion Reflection #10 due 4/27
5/1	M	Journal Club 7	Read Journal Club Papers	Paper Discussion Reflection #11 due 5/2
5/3	W	Journal Club 8	Read Journal Club Papers	Review Article 1 st Draft due in class Paper Discussion Reflection #12 due 5/11
5/8	M	Peer Review Groups Review Article	Read and comment on group member's review articles	
5/10	W	Course Wrap-Up		
5/22	M			Review Article Final Draft