This course is designed to give students a comprehensive understanding of the inner workings of the major inhibitory neurotransmitter in the brain. Specifically, we will conduct a thorough investigation of the role GABA plays in neural function and dysfunction. This will include discussions of GABA receptor structure and function and how it relates to disorders such as addiction, epilepsy, and anxiety. Most of our time will be devoted to an investigation of primary literature and how it informs our current understanding of inhibition in the nervous system.

Learning Objectives:

Students who successfully complete this course will be able to:

- Describe GABA receptor subtypes, their structure, and how that affects their function.
- Explain the importance of local intracellular and extracellular chloride concentration on GABA function.
- Characterize the role of GABA in synaptic plasticity, epilepsy, and psychiatric disorders.
- Summarize the effects and mechanism of action of multiple GABAergic drugs such as benzodiazepines.
- Define personal learning goals and assess your own progress towards those goals

Students who complete this course will be able to:

- Demonstrate knowledge of and the ability to apply the learning objectives listed above.
- Think like a scientist and be able to dive deep into a scientific problem on one's own or as a group
    - Be able to evaluate a scientific study identifying: hypothesis being tested, assumptions made, expected outcomes, data and analysis, interpretation of results, link to hypothesis, and follow-up questions to ask.
    - Develop the ability to read primary literature, identify key points, major take-aways, and any holes or shortcomings in the experimental protocol or data interpretation.
    - Actively participate in vigorous scientific discussion to clarify confusing points and identify important take-aways from these exchanges.

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I'D LOVE TO MEET WITH YOU!
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PROFMWEGENER.YOUCANBOOK.ME
TO TALK ABOUT THE CLASS, GRAD SCHOOL, BOARD GAMES, RESEARCH, CAREER PLANS, MY DOG OXFORD, PEDAGOGY, PROCRASTINATION, AND WEB COMICS.

- **GABA is an Ungraded course. What does that mean?**
    - You'll be responsible for identifying what you want to get out of the class and what success in the course means for you.
    - There are no numbers or grades from me throughout the semester. You can request feedback on any piece of work using this form: Feedback Request Form but your assessment of your own work is the main basis of evaluation.
    - You'll complete a Mid-Semester Process Letter to reflect on your progress through the semester and provide evidence to support the midterm grade that best represents your work so far.
    - At the end of the semester, we will meet one on one and discuss what you achieved this semester. You will propose a final grade, I will offer my perspective, and we will enter a grade before you leave the conference.
    - Research shows that grades often get in the way of learning. The goal of this course to build a skill in a stress-free environment. Ungrading helps us do that.

Expectations of student in GABA:

- **Read the assigned readings *before* class and complete the guided reading assignment.** The most important way to make sure you get valuable use out of class time is to walk in the door with some familiarity with the material. Confusion is expected, and so are informed questions. The class discussion will only occur once, and the worst thing you can do is have that be your first exposure to the material.

- **Be prepared to discuss scientific literature readings in class.** As you participate in class discussion, evaluate your initial reading, identifying what you missed or misunderstood, making sure that you update your comprehension to include the contributions of your classmates. Additionally, if you understood something different from your colleagues, share your view as it might help others reevaluate their own.

- **Come with questions about the readings, assignments, or lectures.** It is vitally important to everyone's success in the class that we spend as much of the class time going over the most interesting and challenging concepts. If we spend most of the class discussing things that everyone understood from the reading and then only a small amount of time quickly covering the parts that made no sense, then we will not be making good use of our time.

- **Attend class and be attentive in class.** This course is what you make of it. If you aren't in class, you miss out on opportunities to build skills and work towards your learning goals. Since this is a discussion course, your presence increases the quality of the discussion. Engage with your classmates and community as we build understanding and an evolving skill set.

- **Ask questions in class.** Whether these are for clarification, repetition, or because you're interested and want to know more, student questions make for a better learning environment for all. Additionally, in a class of this size, I expect that all students will show up to class with questions about the readings and how they connect to previous topics or readings. To make the most of our time together, we must all endeavor to demonstrate intellectual curiosity and willingness to wrestle with complex topics.

- **Review/think about/talk about what was covered in class.** In addition to simply showing up for class, this class will require that you spend time between lectures looking over your notes, assigned papers, and thinking about what was discussed. You should expect to spend on average 6-7 hours/week outside class reading research papers, completing reading guides, identifying confusing points or knowledge gaps, and preparing to present figures during paper discussions.

- **Contact the instructor.** I will be meeting regularly with all of you throughout the semester to help you prepare for your presentation and check in on your learning goals. You can drop by Oxford hours on Friday or make a meeting if you want to discuss anything not related to class.

Absolutely *nothing* is more important than your health and well-being.
If you find that you are falling behind or struggling in class due to mental health issues, sexual assault or partner violence, family responsibilities, inability to find safe stable housing or food, please reach out so I can support you. You do not need to disclose details of your personal life for us to work towards a collaborative solution. I am most helpful if you communicate your needs or concerns early and often. If you need to travel out of state to receive healthcare, you will have my full support. For additional information and support, please contact Center for Student Wellbeing (healthydores@Vanderbilt.edu 615-322-0480), Project Safe Center (projectsafe@Vanderbilt.edu 615-322-7233), or Student Care Coordination (studentcare@Vanderbilt.edu 615-343-9355).

Opportunities for Learning and Practice

- **Lecture.** During 4 class meetings towards the beginning of the semester, you will read a literature review (a paper which provides an overview of a topic and established knowledge on that specific topic). I will lead class discussion and ensure we are all on the same page about core GABA information. The purpose of these classes is building foundational knowledge that will help us better understand the primary literature we will read and present throughout the semester.

- **Primary Literature**. There will be a scientific paper you need to read to prepare for each class. The schedule (see below) lists a tentative paper schedule for each week of the semester, these may change as new papers come out or the interests of the class changes the topics for the course. Your colleagues will choose papers they want to present and they will run the class meeting in which we will discuss their chosen paper. Watch Brightspace for updates as reading guides and assigned papers will be announced there. The assignment for the next class will always be posted by the end of the preceding class at the latest.

- **Reading Guides**. Each week we will discuss a primary literature paper and you may be asked to present one figure or reading guide question to the class as a whole after discussing it with a partner or reflecting on your own to identify potential points of confusion. The point of this is to practice leading the discussion as well as to ensure that everyone arrives to class having read the paper and thought about it. It is ok to be confused about some aspect of the figure you are presenting (we're here to figure it out together!) but our meeting will be most productive if we put some thought into it before attending class. You will be asked to submit the assignment before and after class. There is no penalty for missing either, but we'll look at the your pattern of preparation and submission throughout the semester.

- **Class participation.** Students are expected to participate actively in class discussions. Your participation in small group and class-wide discussions during the semester is required. I will offer opportunities for individual conferences to discuss your participation during the semester. You'll be asked to address how you are participating in the class in your mid-semester and end of semester self-evaluation.

- **Peer Feedback.** You will be responsible for providing feedback for your colleagues about their presentations and your experiences working with them during class. You will be paired with a random student partner to present a figure for weekly journal clubs, and afterward you will write a few sentences about what you enjoyed about working with them and where you feel they might improve.

- **Presentation.** In lieu of a cumulative exam or writing assignment, you will be responsible for picking a paper, writing a reading guide for your classmates to complete, and leading a class discussion for that paper. You will pick a date and topic that will best serve you. You will work with a student partner to select a paper and decide which aspects of the paper you would like to emphasize in discussion. You both will meet with me a week before your presentation to review your reading guide and plan. We will meet the week after your presentation to discuss how it went and decide to what extent you achieved the goals you set for the presentation.

Responsibilities

The choice to take this course is entirely up to you. If you do choose to take the course, please do your best to attend all classes on time and to participate in class discussions and activities. In turn, I will make every effort to build a valuable learning experience for every student. If there is ever any way I can improve your learning, or if any topic doesn't capture your interest and you would like to propose an alternative, I welcome feedback (either in class, outside of class, or anonymously).

Finally, it is everyone's responsibility to be respectful of others during class. In science we are often wrong, and learn valuable information and skills from our mistakes or misunderstanding. Additionally, we don't always realize we are mistaken until we say something aloud and have a chance to correct our own comprehension. I expect all members of this class to be aware of this and embrace it as a valuable experience.

Week	Day/Date	Topics	Class Preparation Work
1	1/9 **M**	Syllabus and Paper Reading 101	Read in Class: Syllabus and Ungrading Article
	1/11 **W**	Paper Reading 101 (con't) and Discussion Norms	Smart & Stephenson 2019 *A half-century of gamma-aminobutyric acid* Oh et al., 2016 *De novo synaptogenesis induced by GABA in the developing mouse cortex*
2	1/18 **W**	Student Presentation and Paper Choice	Find Research Paper Possibilities
3	1/23 **M**	GABA & Chloride Transporters	Wilson & Mongin 2019 *The signaling role for chloride in the bidirectional communication between neurons and astrocytes*
	1/25 **W**	Figure Presentation and Journal Club	Gavrikov et al., 2006 *Dendritic compartmentalization of chloride cotransporters underlies directional responses of starburst amacrine cells in the retina*
4	1/30 **M**	Excitatory GABA	Moore et al., 2017 *Seizing Control of KCC2: A New Therapuetic Target for Epilepsy*
	2/1 **W**	Figure Presentation and Journal Club	Chen et al., 2017 *KCC2 downregulation facilitates epileptic seizures*
5	2/6 **M**	$GABA_A$ Structure and Function	Sigel & Steinmann, 2012 *Structure, Function, and Modulation of GABAA Receptors*
	2/8 **W**	Figure Presentation and Journal Club	Knabl et al., 2008 *Reversal of pathological pain through specific spinal GABAA receptor subtypes*
6	2/13 **M**	GABA Drugs	Tan, Rudolph, & Luscher 2011 *Hooked on benzodiazepines: GABAA receptor subtypes and addiction*
	2/15 **W**	Figure Presentation and Journal Club	Tan et al., 2010 *Neural bases for addictive properties of benzodiazepines*
7	2/20 **M**	GABA in Psychiatric Disorders	Student Presentation
	2/22 **W**	Figure Presentation and Journal Club	Wolff et al., 2014 *Amygdala interneuron subtypes control fear learning through disinhibition*
8	2/27 **M**	GABA in Psychiatric Disorders	Student Presentation
	3/1 **W**	Figure Presentation and Journal Club	Ma et al., 2016 *Impaired GABA synthesis, uptake and release are associated with depression-like behavior induced by chronic mild stress*
9	3/6 **M**	GABA in Psychiatric Disorders	Student Presentation
	3/8 **W**	Mid-Semester Reflection and Feedback	

10	3/13 **M** 3/15 **W**	Spring Break	
11	3/20 **M**	GABA in Disease	Student Presentation
	3/22 **W**	Figure Presentation and Journal Club	Kim et al., 2021 *Depolarizing GABA-A current in the prefrontal cortex is linked with cognitive impairment in a mouse model relevant for schizophrenia*
12	3/27 **M**	GABA in Disease	Student Presentation
	3/29 **W**	Figure Presentation and Journal Club	Dargaei et al., 2018 *Restoring GABAergic inhibition rescues memory deficits in a Huntington's disease mouse model*
13	4/3 **M**	GABA and Drugs	Student Presentation
	4/5 **W**	Figure Presentation and Journal Club	Thomas et al., 2018 *Adolescent nicotine exposure alters GABA-A receptor signaling in the VTA and increases adult ethanol self-administration*
14	4/10 **M**	GABA and Drugs	Student Presentation
	4/12 **W**	Figure Presentation and Journal Club	Bocklisch et al., 2013 *Cocaine disinhibits dopamine neurons by potentiation of GABA transmission in the ventral tegmental area*
15	4/17 **M**	GABA: Wild Card	Student Presentation
	4/19 **W**	GABA: Wild Card	Student Presentation
16	4/24 **M**	GABA: Wild Card	Student Presentation
4/25 - 5/4		Final Grade Meetings and Discussion	

Other Optional Events