ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Behavioral Neuroscience 2	PSYC 371	3 credits

PREREQUISITES

PSYC 370

CONTACTS

Course Instructor(s)	Contact Details	Office Location	Office Hours
Jason Snyder	jasonsnyder@psych.ubc.ca --put "371" in the subject line to escape spam filters (especially yahoo users) --no email for course content questions (use Piazza instead) --anonymous feedback: https://forms.gle/oWXyzyjCttpVjz8N7	Koerner F128	--Q&A will primarily occur asynchronously on Piazza. --live Q&A will occur in or after class as time permits --if additional live Q&A is needed, reach out and we will schedule something

COURSE INSTRUCTOR BIOGRAPHICAL STATEMENT

I cringe at the idea of reusing my biographical statement from 370. I could rewrite it entirely. But then what about the 2 or 3 people that did not take 370? Will they have any idea who the real Jason Snyder is? Would the real Jason Snyder please stand up? Funny you should ask because I am already standing up (I use a standing desk). OK let's get serious. Actually, no, forget it let's move on[1].

OTHER INSTRUCTIONAL STAFF

Teaching Assistant: Lucas Calderhead, lmmcubc@student.ubc.ca

COURSE STRUCTURE

The course structure will be nearly the same as PSYC 370: Classes will be conducted in person, and will consist of lectures and group discussion/exercise sessions where we review concepts together and perform various exercises (yogic squats, jumping jacks etc) that reinforce what we have learned. Lecture slides will be provided on Canvas in advance and I aim to have classes will be recorded so that you can review them later if needed. Recorded classes are not meant as a substitute for attended class, since you will only be able to benefit from in-person activities if you are actually present in class and can engage directly. I will only post videos as a means to review since I know that sometimes it

can be difficult to process content and write notes at the same time. Recordings are not to be shared outside of PSYC 371, since class content is only meant to be viewed in the context of the class itself. I encourage your attendance at live lectures so you can ask questions in real time, benefit from discussions and exercises, and enjoy my full wardrobe (I have one new pair of pants that I didn't have in the fall see if you can spot it). We will use Piazza for online asynchronous discussion and Q&A; this will be where all course content questions should go, so that student peers can help answer questions and so that all can benefit from the questions that are asked.

SCHEDULE OF TOPICS

Jan. 10	Lecture 1: Warmup, maybe actual content	
Jan. 12	Lecture 2: Vestibular & Gustatory systems	
Jan. 17	Lecture 3: Prefrontal cortex	Motor control & behavior selection
Jan. 19	Lecture 4: Parietal & premotor cortex	
Jan. 24	Lecture 5: Frontostriatal circuits	
Jan. 26	Lecture 6: Frontostriatal circuits	
Jan. 31	**Test 1 (lectures 1-6)**	
Feb. 2	Lecture 7: Dopamine, addiction and Parkinson's disease	
Feb. 7	Lecture 8: Workshop on literature research	
Feb. 9	Lecture 9: Control of muscles and glands	
Feb. 14	Lecture 10: Autonomic effectors: hypothalamic-pituitary axes	
Feb. 16	Lecture 11: Autonomic effectors: brainstem circuits & behavior	
Feb. 20-24	!!! Reading Week !!!	Low level control
Feb. 28	**Test 2 (lectures 7-11)**	
March 2	Lecture 12: Autonomic control: amygdala and suprachiasmatic nucleus	
March 7	Lecture 13: Brain states: rhythms, attention	
March 9	Lecture 14: Brain states: arousal, sleep	
March 14	Lecture 15: Development – genes and nervous system patterning	
March 16	Lecture 16: Development – neurogenesis and synaptogenesis	Neural development
March 21	Lecture 17: Development – ontogeny of behavior	
March 23	Lecture 18: Adult neurogenesis – history and cellular properties	
March 28	**Test 3 (lectures 12-17)**	
March 30	Lecture 19: Adult neurogenesis – circuit and behavioral functions	
April 4	Lecture 20: Adult neurogenesis – circuit and behavioral functions	Adult plasticity and disorders
April 6	Lecture 21: Disorders: Alzheimer's disease	
April 11	Lecture 22: Disorders: Depression, anxiety, schizophrenia	
April 13	Lecture 23: TBD	
April 17-28	**Test 4 (lectures 18-23)**	

LEARNING OUTCOMES

This course assumes solid background in behavioral neuroscience, and builds directly upon PSYC 370. In that course, you learned about the basics of cellular neurobiology and how neurons interact in circuits to process sensory information and form memories. Here you will use that background to

similarly learn about how neural circuits and brain regions function in many other types of behavior that we experience on a regular basis. Here are specific learning outcomes and study topics, which are organized into 4 thematically-related sections:

1) **Motor systems and behavior selection**. You know how information enters* and is represented in the brain, but how does it lead to action? Here we will learn about frontal cortex and motor systems that regulate how goals are transformed into actions.
    a. Neurons in the frontal cortex and striatum learn about rewards and regulate the actions that attain them
    b. As in the sensory cortex, there is a hierarchical organization, where (anterior) circuits regulate high-level goals and (posterior) circuits regulate specific motor actions
    c. Motor function and action selection are disrupted in addiction and disorders such as Parkinson's disease
    d. Motor acts are ultimately executed by spinal circuitry
2) **Low level control**. Much of what we have learned has been high-level cognition. Here we will learn about how the brain also controls vital bodily functions in order to achieve homeostasis.
    a. The autonomic nervous system and hypothalamus detect the body's internal state and regulate vital bodily functions like temperature, cardiac output, respiration and appetite
    b. Higher brain regions such as the prefrontal cortex, hippocampus and amygdala regulate autonomic responses to stressors and threats
    c. Brain states related to attention, arousal and sleep are associated with different patterns of neural activity and serve distinct functions.
3) **Brain and behavior across the lifespan**. Once upon a time you were only a single cell. Now you are made up of 37 trillion cells, of which ~100 billion are neurons that are wired in a complex but organized fashion. How does this organization occur? How does the mature brain change with aging and experience?
    a. Intrinsic genetic programs guide the development and wiring of the nervous system
    b. Experience shapes neural development
    c. Interplay between brain region development and behavioral capabilities
    d. Neurogenesis occurs throughout adulthood in some brain regions and promotes functional plasticity
4) **Adult plasticity and behavioral disorders**. The greatest amount of plasticity exists during development, but some plasticity persists throughout life and supports learning and recovery from insults and disorders. How do changes in neuronal properties, including plasticity, contribute to human disorders?
    a. Dogma had to be overturned for adult neurogenesis to be accepted
    b. Extended neurogenesis in the hippocampus supports learning and emotional behavior
    c. CNS disorders are characterized by parallel changes in behavior and neural circuits

LEARNING ACTIVITIES

We will use a variety of different types of activities to learn the course content:

Lectures: Admittedly, this is not the most active type of activity, but I include it here for the sake of being complete.

Breakout discussion: We will regularly break from traditional lecturing by forming small groups during class time where you will discuss content, perform exercises and solve problems with one

another. The instructor will hop around as best they can to try to provide some guidance in a more intimate fashion than can be achieved in the standard class format. After these breakout sessions, we will regroup as a full class and share what we have learned.

Piazza Asynchronous Discussion: Inevitably, questions will arise outside of class time. We will therefore use Piazza for asynchronous discussion. All course content questions should be posted in Piazza and students are encouraged to provide answers, which will be moderated, endorsed or elaborated upon by the instructor and the TA. In order to post a question, one first has to explain their understanding of the problem (i.e. don't just say "I don't understand X can someone explain it to me?"). This helps us identify where the confusion lies. Also, many times we answer our own questions when we think carefully about a problem and try to articulate it. To encourage participation, posting can be anonymous (to the class but not the instructor) and extra marks will be given to the top participants. Here is the signup link for the class Piazza forum: https://piazza.com/ubc.ca/winterterm22022/psyc371.

Other: This course has transformed as a result of the pandemic and the ease of online tools is making it much easier to try methods for teaching, learning and giving feedback. We may therefore explore other types of learning activities throughout the term (let me know If you have any suggestions!).

LEARNING MATERIALS

We will use Canvas as our online learning management system. Selected readings will be provided (for free) from the following 2 textbooks: 1) Kandel, E.R. et al. (2012), Principles of Neural Science, 5th Edition. 2) Striedter, GF (2016) Neurobiology: A Functional Approach. ***The textbook readings are not mandatory but they are highly recommended***; they complement and expand upon the class material. Other notes and learning materials will be compiled and provided as lecture slides and associated content (eg videos). ***All of the material covered in lectures, and present in the lecture slides, is testable.*** However, content will be tested proportional to the depth that it was covered. Thus, if I only briefly covered a given topic, and didn't even talk about some of the brain region names indicated on a figure, then it is unlikely that you will be required to know those brain region names for the test.

ASSESSMENTS OF LEARNING

Tests: There will be 4 closed-book tests, spaced approximately equally throughout the term. Each test will be worth 25% of the final grade and will consist of short answer, multiple choice, fill in the blank and abstract watercolor painting questions. The TA will set aside time to review tests with you after you get your grades.

If you miss or cannot write a test fill out this concession request form asap. For acute challenges, the TA will schedule an alternate date. For recurring or long-term issues, consult with Science Advising to come up with a solution.

Bonus participation marks: an extra 2% for the top 3 people, and an extra 1% to the next 2 people, who contribute to the richest discussion and learning environment on Piazza (participate frequently, provide good questions, insightful observations, useful answers and the like).

Regrading: In cases where there is regrading of a question or exam, the entire question or exam will be regraded and the new grade will replace the old grade.

Grading Policies: The Psychology Department mandates a certain class average and standard deviation and so scaling may be required; grades are not final until they appear on your transcript.

DEPARTMENT OF PSYCHOLOGY POSITION ON ACADEMIC MISCONDUCT

Cheating, plagiarism, and other forms of academic misconduct are very serious concerns of the University, and the Department of Psychology has taken steps to alleviate them. In the first place, the Department has implemented software that can reliably detect cheating on multiple-choice exams by analyzing the patterns of students' responses. In addition, the Department subscribes to TurnItIn – a service designed to detect and deter plagiarism. All materials (term papers, lab reports, etc.) that students submit for grading will be scanned and compared to over 4.5 billion pages of content located on the Internet or in TurnItIn's own proprietary databases. The results of these comparisons are compiled into customized "Originality Reports" containing several sensitive measures of plagiarism; instructors receive copies of these reports for every student in their class. In all cases of suspected academic misconduct the parties involved will be pursued to the fullest extent dictated by the guidelines of the University. Strong evidence of cheating or plagiarism may result in a zero credit for the work in question. According to the University Act (section 61), the President of UBC has the right to impose harsher penalties including (but not limited to) a failing grade for the course, suspension from the University, cancellation of scholarships, or a notation added to a student's transcript. All graded work in this course, unless otherwise specified, is to be original work done independently by individuals. If you have any questions as to whether or not what you are doing is even a borderline case of academic misconduct, please consult your instructor. For details on pertinent University policies and procedures, please see Chapter 5 in the UBC Calendar (http://students.ubc.ca/calendar) and read the University's Policy 69 (available at http:/www.universitycounsel.ubc.ca/policies/policy69.html).

UNIVERSITY POLICIES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on **the UBC Senate website.**

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[1]PSYC 370 biographical statement, fyi: Hi. My name is Jason and you can call me that. You can call me Dr/Prof Snyder too, or J-Dawg, or any of my old nicknames (respect if you can find them). I still am a student of neuroscience because there will be tons to learn about the brain until the day I die. But I also was a student in a classroom, just like you, once upon a time. I did an undergraduate degree in Physiology at the University of Toronto, focusing on neuroscience in my upper years. I stayed in that department for my PhD, and studied the electrophysiological properties of newborn neurons in the hippocampus. In particular I studied long-term plasticity since I was (and still am) interested in the biological basis of memory. However, at some point I wanted to study more than just biology and wanted to link my findings more directly to behavior (since this is more relatable and is also the ultimate function of the brain). So, for the latter portion of my PhD I collaborated with psychologists and studied memory (impairments) in rats that lacked adult neurogenesis. After finishing my PhD I went to the National Institutes of Health in Bethesda, Maryland where I continued to study the function of adult-born neurons in memory, anxiety and depression-like behaviors in transgenic mice and rats. I did a bit more of this in Toronto at SickKids Hospital before starting a lab and teaching at UBC in 2013. I draw on my background in physiology when teaching since modern approaches for studying the brain rely on an understanding of how neurons work, individually and cooperatively, so that they can be manipulated with precision. Also, behaviors can increasingly be understood in terms of their underlying physiological patterns of neuronal activity.