

## PSYC 473 - NEUROBIOLOGY OF PSYCHIATRIC DISORDERS - 2020

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### Office Hours:

- **Friday's, 11:00 – 12:00; weekly, optional group meetings online at TEAMS**
- one-on-one meetings on TEAMS can be arranged (email me and we'll arrange a time to meet)

### COURSE DESCRIPTION

Lectures focus on current theories on the neurobiology of psychiatric and neurological disorders (e.g., schizophrenia, mood and anxiety disorders, autism). Student led seminars focus on the evaluation of animal models for investigating neural mechanisms of psychopathology.

### INTENDED STUDENT LEARNING OUTCOMES

To complete this course, students will demonstrate their ability to:

1. Describe the value and limitations of using animal models to study human psychopathology.
2. Discuss hypotheses about the neurobiology of psychiatric disorders at multiple levels of analysis (e.g., genetic, epigenetic, molecular, cellular, neural structure and neural system levels)
3. Locate relevant, current literature, and summarize and integrate complex ideas from a broad literature
4. Write effectively for different purposes (e.g., short report geared for lay public; short critical report geared for the scientific community)
5. Design and deliver an effective oral presentation (PowerPoint/Prezi/KeyNote)
6. Effectively participate in group discussions and peer evaluations

PREREQUISITES: PSYC 271 or equivalent. There is **no** required text for the course.

### ASSIGNMENTS AND GRADING

ASSIGNMENT	DUE DATE	COMPONENTS	MARK
PRESS RELEASE *	Monday of your assigned presentation week	Peer evaluation	5%
		Instructor evaluation	20%
POWERPOINT PRESENTATION *	Monday of your assigned presentation week	Peer evaluation	5%
		Instructor evaluation	25%
CLASS PARTICIPATION – PEER EVALUATIONS	Friday of the relevant presentation week		10%
JOURNAL CLUB ARTICLE	Midnight, December 4, 2020		35%

**\* Press Releases and Pre-recorded Presentations are due by noon (12:00 PM) on the Monday of your assigned presentation week. Class evaluations are due by noon (12:00 PM) on the Friday of the respective presentation week. All files should be submitted at TEAMS.**

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## 1. PRESS RELEASE: SHORT WRITTEN REPORT

You will each be assigned a recently published article to showcase for the class. The goal is to share what you've learned by studying the article. You can find your assigned article and presentation week under the "Student Presentations" sections of the course schedule (starting on pg. 6). Your first assignment is to translate the scientific article into a media style press release, written in lay language, for a non-expert audience (maximum length is 2 pages). Tips for writing press releases, as well as some sample press releases (written by professional science writers) are posted at OnQ (under Course Readings and Resources). You can be as creative as you want but your primary mark will be based on the content. You should aim to cover only the key findings (the big take-home message) in a way that an intelligent, non-expert would understand. You will upload your Press release to TEAMS. **Your press release is due by noon (12:00 PM) on the Monday of your assigned presentation week. Please use the following filename structure: your last name\_assignment\_course#; e.g., Brown\_PressRelease\_Psyc473.**

## 2. PRE-RECORDED PRESENTATION

Your presentation will be based on the same article as your press release. Presentations should be pre-recorded in Power Point (or similar) format. The only restriction is that you must use a program that lets your presentation be converted to a video (MP4) file. Presentations should be approximately 20-25 minutes in length (**MAX = 25 min**). You should include a summary of the relevant background information, specific purpose of the study, methods (with a primary focus on behavioral methods) and results of the article. You should also discuss the relevance of the article to our understanding of psychopathology. Gear your delivery for an audience of senior undergraduates with varying backgrounds. This does not mean you should oversimplify the material. Instead, aim to teach the material to the class. You will upload your finished product, as a video file, to TEAMS – Our group name on TEAMS is PSYC 473 Neurobiology of Psychiatric Disorders F20. (I'll link all presentations to OnQ site via STREAMS). Tips and instructions for doing a pre-recorded presentation in PowerPoint, and how to convert it to a video file, are posted at OnQ, under Course Readings and Resources. **Your pre-recorded presentation is due, at TEAMS, by noon (12:00 PM) on the Monday of your assigned presentation week. Please use the following filename structure: your last name\_assignment\_course#; e.g., Brown\_presentation\_Psyc473.**

## 3. CLASS PARTICIPATION

**EVALUATION OF PRESS RELEASES (PR) AND STUDENT PRESENTATIONS.** You are expected to provide an informal critique of the press releases and PowerPoint presentations generated by your classmates. Your evaluation should include 2 short paragraphs (roughly 150 - 200 words each), one focused on the PR and the other the PowerPoint presentation. This assignment is meant to be done quickly. Here are some examples of what you might address: Was the layout/formatting of the PR effective? Was the information well organized? Was the report clear and sufficient for a lay audience to understand? Was it attention grabbing? Was there an aspect of the PR (or presentation) that you really liked or, conversely, that you think didn't work? What would make it better? Be specific and provide examples to support your comments. For the PowerPoint Presentation, you might comment on the flow; whether the images/slides were effective; was sufficient background info provided to follow the study's rationale?, etc.. Please provide the kind of critical feedback that you yourself would find helpful (e.g., what worked and what didn't). **Please assign 2 grades (out of 10); one for the PR and one for the PowerPoint presentation. Email your evaluations to me ([menard@queensu.ca](mailto:menard@queensu.ca)) by noon (12:00 PM) on the Friday of the week that the original assignments were posted in. Please use the following filename structure: your last name\_last name of student you're evaluating\_course; e.g., Brown\_EvaluationSmith\_Psyc473. Please submit a separate file for each student you evaluate.** I will select quotes from these evaluations and compile them into an anonymous feedback file for the student under evaluation.

## 4. JOURNAL CLUB ARTICLE.

The *Journal Club article* is your opportunity to write a brief, scientific communication for experts rather than for a lay audience. For this assignment you will select and review a topical empirical paper of your choice. It can be the

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paper you did your oral presentation on, any other empirical paper showcased in class or a paper that wasn't covered in class. **The only restrictions are that the paper you review:**

- 1) has to be relevant to some aspect of the brain and psychopathology (it can come from either the clinical (human) or preclinical (animal) literature or both)
- 2) has been published in the last 5 years (i.e., since 2015)
- 3) is selected from one of the following journals: *Science*; *Nature*; *Nature Neuroscience*; *The Journal of Neuroscience*; or *PNAS*.

Your review should be styled like a Journal Club submission to *The Journal of Neuroscience* Journal Club (described further at that journal's website - <https://www.jneurosci.org.proxy.queensu.ca/content/jneurosci-journal-club>.)

Note, there are some minor changes to the formatting requirements listed at that website and the ones for your class assignment. Please follow the formatting requirements listed below:

### Formatting for the Journal Club Article

- 1) **1500 words max** (not including references); Times New Roman font, 11pt, single spaced.
- 2) Double columns are a nice touch (but if you prefer single columns they are also permitted)
- 3) Title is required but not on a separate title page; just put the title and your name at the top of the page
- 4) Headers are encouraged as an organizational tool (but are not required)
- 5) Use a numbered citation system in the text (APA in the reference list)
- 6) There is no limit to the number of references you use, but **at least 5 references must not** be in the reference list of the original article.

As stated at *The Journal of Neuroscience* website, you should include a brief description of the topic and research question(s) addressed in the paper you are reviewing, a summary of the key findings and brief discussion of why they are important. **Your review must do more than just summarize the original article.** You need to provide a logical, original critique of the work; e.g., Are there any limitations that the original authors failed to adequately address? How well do the findings fit with other reports on the same topic? Are they supported by other reports in the literature? Did the authors fail to report any contradictory literature? How do the findings advance our understanding of the specific mental disorder under investigation? Where should the research go next? These are just general guidelines to get you started (and will not apply to all papers). You might approach your critique in a completely different way, but whatever direction you take it in, you must support your comments by citing the relevant literature.

You will be graded for content, overall readability, organization, grammar, spelling, punctuation and correct referencing style. 1500 words, single spaced is roughly 2 pages. It can be very challenging to get everything you want to say into a short report. You will want to give yourself enough time to edit several drafts of your work, and aim for tight precise prose. You are writing for an expert audience and so do not have to define concepts or over-describe things that an expert should be aware of. The experimental approach should be illustrated, but briefly; e.g., if the authors tested rats in an elevated plus-maze then all you need to say is something like this: "Rats were tested in the elevated-plus maze, a widely used test of anxiety-related behaviour." Reference your source and then indicate the findings.

If you do choose a recent paper (published within the last 2 months) from *J. Neurosci*, you might consider submitting your Journal Club article for publication.

Examples of Journal Club articles and the relevant original paper under review are available at *The Journal of Neuroscience* and at OnQ (under Course Readings and Resources).

**Your Journal Club Article is due by midnight, Dec 4 (1% deduction for every day late). Please email your Journal Club article to me, as a word document, using the following file name: YourLastName\_JournalClub\_Psyc473.doc.**

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### MARKING SCHEME

Psych 473 will utilize a “Numbers In, Letters Out” marking scheme: The final grade you receive for the course will be derived by converting your numerical course average to a letter grade, according to Queen’s Official Grade Conversion Scale.

#### Queen’s Official Grade Conversion Scale

<b>Grade</b>	<b>Numerical Course Average (Range)</b>
<b>A+</b>	<b>90-100</b>
<b>A</b>	<b>85-89</b>
<b>A-</b>	<b>80-84</b>
<b>B+</b>	<b>77-79</b>
<b>B</b>	<b>73-76</b>
<b>B-</b>	<b>70-72</b>
<b>C+</b>	<b>67-69</b>
<b>C</b>	<b>63-66</b>
<b>C-</b>	<b>60-62</b>
<b>D+</b>	<b>57-59</b>
<b>D</b>	<b>53-56</b>
<b>D-</b>	<b>50-52</b>
<b>F</b>	<b>49 and below</b>

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### Statement on Academic Integrity

The following statement on academic integrity builds on a definition approved by Senate and is designed to make students aware of the importance of the concept and the potential consequences of departing from the core values of academic integrity. It is highly recommended that this statement be included on all course syllabi. Instructors may also consider including this statement with each assignment.

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see [www.academicintegrity.org](http://www.academicintegrity.org)). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities <http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities>).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1>), on the Arts and Science website (see <http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity>), and from the instructor of this course.

Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

## COURSE STRUCTURE

BACKGROUND LECTURES	
(Instructor delivered – I will send out an announcement from OnQ when Lecture video have been posted)	
Week 1	LECTURE: Course objectives and structure
Sept 8-11	LECTURE: Animal models of psychopathology
Week 2	LECTURE: Signaling molecules, gene expression and epigenetics
Sept 14-18	LECTURE: Neuroscience methods
Week 3	LECTURE: Neuroscience methods
Sept 21-25	

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Week 3	SECTION TOPIC LECTURE: STRESS AND PSYCHOPATHOLOGY	
STUDENT PRESENTATIONS		
	Name of Student Presenter	Article
<p><b>Week 4</b> <b>Sept 20 –</b> <b>Oct 2</b></p>		<p>Raineki, et al., (2019) During infant maltreatment, stress targets hippocampus, but stress with mother present targets amygdala and social behavior. <i>PNAS</i>, 116 (45) 22821-22832.</p> <p>Provensi, et al., (2019) Preventing adolescent stress-induced cognitive and microbiome changes by diet. <i>PNAS</i>, 116 (19) 9644-9651.</p> <p>Venkataraman, et al., (2019) Modulation of fear generalization by the zona incerta. <i>PNAS</i>, 116 (18) 9072-9077.</p> <p>Dudek et al., (2020) Molecular adaptations of the blood–brain barrier promote stress resilience vs. depression. <i>PNAS</i>, 117(6) 3326-3336.</p>
<p><b>Week 5</b> <b>Oct 5-9</b></p>		<p>Ren et al., (2016) Gene deficiency and pharmacological inhibition of soluble epoxide hydrolase confers resilience to repeated social defeat stress. <i>PNAS</i>, E1944-E1952.</p> <p>Heshmati, et al., (2018) Cell-type-specific role for nucleus accumbens neuroligin-2 in depression and stress susceptibility. <i>PNAS</i> 115 (5) 1111-1116.</p> <p>Choi, et al., (2018) Targeted knockout of a chemokine-like gene increases anxiety and fear responses. <i>PNAS</i>, 115 (5) E1041-E1050.</p> <p>Meyer et al., (2019) Ventral hippocampus interacts with prelimbic cortex during inhibition of threat response via learned safety in both mice and humans. <i>PNAS</i>, 116 (52) 26970-26979.</p>

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<b>Week 6</b> <b>Oct 12-16</b>	<b>SECTION TOPIC LECTURE: NEUROBIOLOGY OF SCHIZOPHRENIA</b>	
<b>STUDENT PRESENTATIONS</b>		
	<b>Name of Student Presenter</b>	<b>Article</b>
<b>Week 6</b> <b>Oct 12-16</b>		<p>Wang, et al., (2018) Controlling of glutamate release by neuregulin3 via inhibiting the assembly of the SNARE complex. <i>PNAS</i>, 115 (10) 2508-2513.</p> <p>Jiao, et al., (2017) Transmembrane protein 108 is required for glutamatergic transmission in dentate gyrus. <i>PNAS 2017</i>, 114, 1177-1182.</p>
<b>Week 7</b> <b>Oct 26-30</b>		<p>Ma et al., (2019) Key role of soluble epoxide hydrolase in the neurodevelopmental disorders of offspring after maternal immune activation. <i>PNAS</i>, 116 (14) 7083-7088.</p> <p>Diamantopoulou, et al., (2017) Loss-of-function mutation in <i>Mirta22/Emc10</i>rescues specific schizophrenia-related phenotypes in a mouse model of the 22q11.2 deletion. <i>PNAS</i>, 114 (30), E6127-E6136</p> <p>Tomasella et. al., (2018) Deletion of dopamine D<sub>2</sub> receptors from parvalbumin interneurons in mouse causes schizophrenia-like phenotypes. <i>PNAS</i>, 115 (13) 3476-348.</p> <p>Wang, et al., (2018) Genetic recovery of ErbB4 in adulthood partially restores brain functions in null mice. <i>PNAS</i>, 115 (51) 13105-13110.</p>
<b>Week 8</b> <b>Oct 26-30</b>		<b>MID-TERM BREAK</b>

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<b>Week 9</b>		<b>SECTION TOPIC LECTURE: NEUROBIOLOGY OF CHILDHOOD PSYCHIATRIC DISORDERS</b>	
<b>Name of Student Presenter</b>		<b>Article</b>	
<b>Week 9</b> <b>Nov 2-6</b>		<p>Lieselot, et al., (2018) Mecp2 female mouse model for Rett syndrome reveals that low-level MECP2 expression extends life and improves neuromotor function. <i>PNAS</i>, 115 (32) 8185-8190.</p> <p>Wenderski, et a., (2020) Loss of the neural-specific BAF subunit ACTL6B relieves repression of early response genes and causes recessive autism. <i>PNAS</i>, 117(18) 10055-10066.</p>	
<b>Week 10</b> <b>Nov 16-20</b>		<p>Pu, et al., (2020) Maternal glyphosate exposure causes autism-like behaviors in offspring through increased expression of soluble epoxide hydrolase. <i>PNAS</i>, 117(21) 11753-11759.</p> <p>Wang, et al., (2019) Maternal diabetes induces autism-like behavior by hyperglycemia-mediated persistent oxidative stress and suppression of superoxide dismutase 2. <i>PNAS</i>, 116 (47) 23743-23752.</p> <p>Yan, et al., (2018) Activation of autophagy rescues synaptic and cognitive deficits in fragile X mice. <i>PNAS</i>, 115 (41) E9707-E9716.</p> <p>Robson, et al., (2018) p38<math>\alpha</math> MAPK signaling drives pharmacologically reversible brain and gastrointestinal phenotypes in the SERT Ala56 mouse. <i>PNAS</i>, 115 (43) E10245-E10254.</p>	



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<b>Week 11</b>		<b>SECTION TOPIC LECTURE: NEUROBIOLOGY OF SUBSTANCE ABUSE</b>	
<b>Name of Student Presenter</b>		<b>Article</b>	
<b>Week 11</b> <b>Nov 16-20</b>		<p>Flagela, et al., (2016) Genetic background and epigenetic modifications in the core of the nucleus accumbens predict addiction-like behavior in a rat model. <i>PNAS</i>, E2861–E2870.</p> <p>Uhl, et al., (2018) Cocaine reward is reduced by decreased expression of receptor-type protein tyrosine phosphatase D (PTPRD) and by a novel PTPRD antagonist. <i>PNAS</i>, 115 (45) 11597-11602.</p>	
<b>Week 12</b> <b>Nov 23-27</b>		<p>Venniroya, et al., (2020) Abstinence-dependent dissociable central amygdala microcircuits control drug craving <i>PNAS</i>, 117 (14) 8126–8134.</p> <p>Hu, et al., (2019) Compulsive drug use is associated with imbalance of orbitofrontal- and prelimbic-striatal circuits in punishment-resistant individuals. <i>PNAS</i>, 116 (18) 9066-9071.</p> <p>Kallupia, et al., (2020) Nociceptin attenuates the escalation of oxycodone self-administration by normalizing CeA–GABA transmission in highly addicted rats. <i>PNAS</i>, 117 (4) 2140–2148.</p> <p>Kim, et al., (2018) Dopamine D2 receptor-mediated circuit from the central amygdala to the bed nucleus of the stria terminalis regulates impulsive behavior. <i>PNAS</i>, 115 (45) E10730-E10739.</p> <p>Spiga, et al., (2014) Hampered long-term depression and thin spine loss in the nucleus accumbens of ethanol-dependent rats. <i>PNAS</i>, 111, E3745–E3754.</p>	
<b>Week 13</b> <b>Nov 30- Dec 4</b>		<b>TBA</b>	