PSYC 473 - NEUROBIOLOGY OF PSYCHIATRIC DISORDERS

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Office Hours: Tuesdays, 1:00 – 3:00
or by appointment

COURSE DESCRIPTION

Lectures will focus on current theories on the neurobiology of psychiatric and neurological disorders (e.g., schizophrenia, mood and anxiety disorders, autism). Seminars will 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. to understand hypothesis about the neurobiology of psychiatric disorders at multiple levels of analysis (e.g., genetic, epigenetic, molecular, cellular, neural structure and neural system levels)
3. to 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; review article 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 205, 271 and 272, or equivalent. There is **no** required text for the course.

ASSIGNMENTS AND GRADING

ASSIGNMENT	COMPONENTS	MARK
ORAL PRESENTATION	**Peer evaluation**	**5%**
	Instructor Evaluation	**25%**
CLASS PARTICIPATION	• **Participation in seminars** • **Peer evaluations** • **Reader (X 2)**	**10%**
PRESS RELEASE (PR)	**Peer evaluation**	**5%**
	Instructor Evaluation	**15%**
TERM PAPER		**40%**

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ORAL PRESENTATIONS

Each student will give one classroom presentation on a recently published article. (Presentation dates and articles are listed under the "Student Presentations" sections of the course schedule below). The presentations should be in Power Point (or similar) format and approximately 20-25 minutes in length (MAX = 25 min; you can't go over this limit or it can reduce the time available to the next presenter or, if you are the last presenter of the day you won't have time to finish). 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.

PRESS RELEASE: SHORT WRITTEN REPORT

The short written report will be based on the paper used for your oral presentation. It should be written using the format of a media news release (maximum length is 2 pages). Your press release is due one week prior to your oral presentation and should be sent to me as an e-mail attachment. Press releases will be put on the PSYC 473 Web site as a means to prepare your fellow students for the oral presentation.

CLASS PARTICIPATION

1. **EVALUATION OF PRESS RELEASE.** All students are expected to read and provide a broad, informal critique of **each** press release (PR). Your evaluation should take the form of a short paragraph (roughly100 words – 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 flow of the information well organized? Sentence structure? Grammar? Was the report clear and sufficient for a lay audience to understand? Was it attention grabbing? Was there any aspect that you really liked? That you think didn't work? What would make it better? Provide examples to support your comments. These questions are just a guide – you don't have to answer all (or any) of them. The goal is to provide *your* general impression of the PR. Please do this prior to class. An electronic evaluation form will be posted online that you can use for entering your evaluation of both PR's and oral presentations (see below).

2. **EVALUATION OF STUDENT ORAL PRESENTATIONS.** All students in the class are expected attend seminars and provide an informal, general evaluation of **each** student oral presentation. These evaluations are done "on the fly" in class (i.e., during the presentation or shortly there after).

   Your evaluations forms should be emailed to me with the following file name: Your last name_presenter's last name_Psyc473.doc (e.g., Smith_Brown_Psyc473.doc). The evaluations are due on the same day as the presentation.

3. **READER**. Each student will serve as an assigned reader for two oral presentations. The reader's role is to read the empirical paper being presented and come to class with 4-5 questions (written out) that you will ask at the end of the presentation. (You do NOT have to send your questions to me, having them written out just makes it easier for you in class).

TERM PAPER

The term paper will be a review of original research articles on the neurobiology of a psychopathological disorder. The paper should not exceed 15 double-spaced pages (11 pnt font), not including references. Your review must include at least 15 references to recent (i.e., 2002-2017) original empirical papers. Books, review papers or empirical papers 2000 can be used for background material but they will not contribute to the requirement of reviewing *at least* 15 recent empirical papers. The articles can come from either the clinical (human) or preclinical (animal) literature or both. Term papers will be graded for content (e.g., introduction, body, integration and conclusions) as well as style (e.g., overall

readability, organization, grammar, spelling, punctuation and correct referencing style). The paper should illustrate how the research findings might further our understanding of the neurobiology of a given psychopathology.

The term paper is due by midnight, **Dec 1** (1% deduction for every day a paper is late). Please email your paper to me using the following file name: YourLastName_TermPaper_Psyc473.doc

Examples of term paper topics.

- Current support for the dopamine theory of schizophrenia
- GABA involvement in schizophrenia
- Glutamate hypothesis of schizophrenia
- Neurodevelopmental aspects of schizophrenia
- Neurodevelopmental aspects of autism
- Neurobiology of attention deficit disorder
- Impact of early life adversity of the development of neural systems that regulate stress reactivity
- Gene-environment interactions and psychopathology (e.g., affective disorders)
- Neural adaptations following long-term administration of antidepressant drugs
- Cytokines, the immune system and depression
- Animal models of drug addiction, anxiety, schizophrenia, depression, post-traumatic stress disorder, Alzheimer's disease, fetal alcohol syndrome, autism spectrum disorders…etc. (pick one)
- The influence of stress (and/or chronic administration of antidepressant drugs) on behavior and neurogenesis: implications for stress-related disorders
- Neurotrophic theory of depression and stress-related disorders
- Estrogen, serotonin and depression
- Dopamine receptor sub-types and drug addiction
- Neuroplasticity and drug addiction
- Neural basis for individual differences in vulnerability to drug addiction
- Stress during adolescence as a vulnerability factor for psychopathology in later life
- The microbiome and psychopathology
- Epigenetics and psychopathology (in general, or focus on a specific disorder like schizophrenia or autism or depression)

NOTE: You may propose your own topic for the term paper, but please clear your topic with me no later than Nov 1.

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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

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

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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). 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.

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DATE	LECTURE TOPICS
Mon. Sept. 11	Course objectives and structure
Wed. Sept. 13	LECTURE: Animal models of psychopathology
Mon. Sept. 18	LECTURE: Signaling molecules, gene expression and epigenetics
Wed. Sept. 20	LECTURE: Neuroscience methods
Mon. Sept. 25	LECTURE: Individual Differences – The HPA axis, early adversity and epigenetics

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DATE	SECTION TOPIC STRESS, ANXIETY AND DEPRESSION	
Wed. Sept. 27	LECTURE: Neurobiology of affective disorders	
DATE/ PRESENTERS	**STUDENT PRESENTATIONS**	**READERS**
Mon. Oct.2	Debiec, et al., (2014) Intergenerational transmission of emotional trauma through amygdala-dependent mother-to-infant transfer of specific fear. *PNAS, 111*, 12222–12227. Rincón-Cortés, et al., (2015) Enduring good memories of infant trauma: Rescue of adult neurobehavioral deficits via amygdala serotonin and corticosterone interaction. *PNAS, 112*, 881–886.	
Wed. Oct. 4	Hodes, et al., (2014) Individual differences in the peripheral immune system promote resilience versus susceptibility to social stress. *PNAS, 111,* 16136–16141. Kleinridders, et al., (2015) Insulin resistance in brain alters dopamine turnover and causes behavioral disorders. *PNAS, 112,* 3463-3468.	
Mon. Oct. 9	**NO CLASS – THANKSGIVING HOLIDAY**	
Wed. Oct. 11	Wang et al., (2015) Norbin ablation results in defective adult hippocampal neurogenesis and depressive-like behavior in mice. *PNAS, 112*, 9745–9750. Aurbach, et al., (2015) Fibroblast growth factor 9 is a novel modulator of negative affect. *PNAS, 112*, 11953–11958.	
Mon. Oct. 16	Fuchikami, et al., (2015) Optogenetic stimulation of infralimbic PFC reproduces ketamine's rapid and sustained antidepressant actions. *PNAS, 112*, 8106–8111. Sachs, et al., (2015) Brain 5-HT deficiency increases stress vulnerability and impairs antidepressant responses following psychosocial stress. *PNAS, 112,* 2557-2562.	

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DATE	SECTION TOPIC - NEUROBIOLOGY OF SCHIZOPHRENIA	
Wed. Oct. 18	LECTURE: Neurobiology of schizophrenia	
DATE/ PRESENTERS	**STUDENT PRESENTATIONS**	**READERS**
Mon. Oct. 23	Hayashi-Takagi, et al., (2014) PAKs inhibitors ameliorate schizophrenia-associated dendritic spine deterioration in vitro and in vivo during late adolescence. *PNAS, 111*, 6461–6466. Jiao, et al., (2017) Transmembrane protein 108 is required for glutamatergic transmission in dentate gyrus. *PNAS 2017*, 114, 1177-1182.	
Wed. Oct. 25	Hines, et al., (2013) Disrupting the clustering of GABAA receptor α2 subunits in the frontal cortex leads to reduced γ-power and cognitive deficits. *PNAS, 110,* 16628–16633. Gilani, et al., (2014) Interneuron precursor transplants in adult hippocampus reverse psychosis-relevant features in a mouse model of hippocampal disinhibition. *PNAS, 111,* 7450–7455.	
Mon. Oct. 30	Bahari-Javan, et al., HDAC1 links early life stress to schizophrenia-like phenotypes. *PNAS, 114,* E4686-E4694. Malkova, et al., (2014) Manganese-enhanced magnetic resonance imaging reveals increased DOI-induced brain activity in a mouse model of schizophrenia. *PNAS, 111,* E2492–E2500.	

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DATE	SECTION TOPIC - NEUROBIOLOGY OF CHILDHOOD PSYCHIATRIC DISORDERS	
Wed. Nov. 1	LECTURE: Neurobiology of childhood psychiatric disorders	
DATE/ PRESENTERS	**STUDENT PRESENTATIONS**	**READERS**
Mon. Nov. 6	Schaafsma, et al., (2017) Sex-specific gene-environment interactions underlying ASD-like behaviors. *PNAS, 114,* 1383-1388. Bhattacherjee, et al., (2017) Neuronal cytoskeletal gene dysregulation and mechanical hypersensitivity in a rat model of Rett syndrome. *PNAS, 114,* E6952-E6961.	
Wed. Nov. 8	Li, et al., (2015) Synaptic P-Rex1 signaling regulates hippocampal long- term depression and autism-like social behavior. *PNAS, 112*, E6964-E6972. Vien, et al., (2015) Compromising the phosphodependent regulation of the GABA-A R β3 subunit reproduces the core phenotypes of autism spectrum disorders. *PNAS, 112*, 14805–14810.	
Mon. Nov. 13	Seese, et al., (2014) Spaced training rescues memory and ERK1/2 signaling in fragile X syndrome model mice. *PNAS, 111*, 16907–16912. Castro, et al., (2014) Functional recovery with recombinant human IGF1 treatment in a mouse model of Rett Syndrome. *PNAS, 111*, 9941–9946.	

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DATE	SECTION TOPIC - NEUROBIOLOGY OF SUBSTANCE ABUSE	
Wed. Nov. 15	LECTURE: Neurobiology of substance abuse.	
DATE/ PRESENTERS	**STUDENT PRESENTATIONS**	**READERS**
Mon. Nov. 20	Flagel, et al., (2016) Genetic background and epigenetic modifications in the core of the nucleus accumbens predict addiction-like behavior in a rat model. *PNAS, 113* - E2861-E2870. Damez-Werno, et al., (2016) Histone arginine methylation in cocaine action in the nucleus accumbens. *PNAS, 113,* Published online before print August 9, 2016, doi: 10.1073/pnas.1605045113.	
Wed. Nov. 22	Spiga, et al., (2014) Hampered long-term depression and thin spine loss in the nucleus accumbens of ethanol-dependent rats. *PNAS, 111*, E3745–E3754. Hirth, et al., (2016) Convergent evidence from alcohol-dependent humans and rats for a hyperdopaminergic state in protracted abstinence *PNAS, 113,* 3024–3029.	
Mon. Nov. 27	Ma, et al., (2016) Re-silencing of silent synapses unmasks anti-relapse effects of environmental enrichment. *PNAS, 113*, 5089–5094. Mizoguchi, et al., (2015) Insular neural system controls decision-making in healthy and methamphetamine-treated rats. *PNAS, 112,* E3930-E3939.	
Wed. Nov. 29	Reserve day for overflow student presentations	