IHGEN670: Advances in Human Genetics 1:
Neurogenetics; current topics in genetics of neurological disorders
(3 credits)

GENERAL INFORMATION

Course Coordinator
Dr. Ziv Gan-Or
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Department of Human Genetics
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Instructors
Dr. Ziv Gan-Or
Dr. Geneviève Bernard
Dr. Thomas Durcan
Dr. Austen Milnerwood
Dr. Jean-Baptiste Rivière

Maximum Preferred Class Size: 20
Day and Time: Wednesdays 1:00 – 4:00 PM, FALL2017
Place: Stewart Biology Building, Room S4/106

Calendar Course Description: This course will deal with recent progress in genetics of neurological disorders, and its applications to health care. A specific focus will be given to current controversies and issues related to proper implementation of genetics research, concepts and methodologies.

Academic Integrity: McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of scientific misconduct, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (www.mcgill.ca/students/srr/academicrights)

LEARNING OUTCOMES
The goal of the course is for the students to gain detailed knowledge about the design, analysis and interpretation of genetic studies of neurological disorders. By the end of the
course students should be able to synthesize and critically read scientific publications, and
to develop scientific writing skills.

**COURSE CONTENT**
This course will cover various, current topics in neuro-genetics, focusing on the genetics of
diseases such as Parkinson’s disease, dementias, amyotrophic lateral sclerosis, and other
common and rare neurological disorders. Through covering controversial topics, the
students will develop critical analysis of published genetic studies, and will be able to
design their own experiments in the most appropriate way for their needs. Methodological
issues related to genome wide association studies, whole exome/genome studies, CRISPR
experiments, genetic animal models and others will be discussed. The students will get
experience in critically presenting data, performing peer review, and basic writing skills.

The course is comprised of 13 sessions. There are 12 sessions of 3 hours/week given by the
5 instructors, where each instructor is responsible for various numbers of sessions (see
detailed schedule). Typically, with the exception of the first two sessions that will include
lectures by the course instructors, each session comprises of a 1.5-hour lecture and a 1.5-
hour class discussion of a selected scientific paper. The 13th session is a 1-hour seminar
given by guest speaker. Following the seminar the students and the instructor will get an
opportunity to meet (~1h) in person with the speaker and discuss various topics from the
course.

**INSTRUCTIONAL METHOD**
The general format for the course will be an introductory presentation by the instructor
followed by student presentations, for example, a critical analysis of one or two papers.
Student participation during each session is required. Assignments are generally due one
week after the last class of each instructor and deadlines will be made available from the
instructors of each subtheme. Failure to meet a deadline will result in a failing grade.
Extensions may be granted for reasons of health or family circumstances. However,
students must submit a written request by email to the course coordinator for an extension
prior to the deadline for the assignment.

**COURSE MATERIALS**
The course instructor will select research papers from scientific journals to be discussed
each week. Links to the papers and other suggested readings will be published under your
account at myCourses at least 2 weeks prior to the session. The presentation by the
instructor will be uploaded to myCourses and accessible following the completion of the
session.

**ASSIGNMENTS AND EVALUATIONS**
*Grade is PASS/FAIL:
50% based on evaluation of presentation and participation in class

50% based on assignments.

* In PASS/FAIL courses a final grade is assigned to students but only a PASS or FAIL appears in their academic record

Student assignments include 1-2 presentations of scientific papers, 1-2 written commentary on a subtheme, OR critique of the papers discussed in the subtheme.

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<thead>
<tr>
<th>Date</th>
<th>Theme</th>
<th>Topic</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>Sep 6</td>
<td>Introduction to Neurogenetics</td>
<td>The uniqueness of brain disorders and the need for unique study approaches, or – “where are the medications?”</td>
<td>Ziv Gan-Or</td>
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<tr>
<td>Sep 13</td>
<td>Introduction to Neurogenetics</td>
<td>The various genetic methodologies used for studying neurological disorders.</td>
<td>Ziv Gan-Or</td>
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<tr>
<td>Sep 20</td>
<td>Genome-wide association studies in complex neurological disorders</td>
<td>The advantages and limitations of genome wide association studies in neurological diseases – Parkinson’s disease as a case study</td>
<td>Ziv Gan-Or</td>
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<td>Sep 27</td>
<td>From genes to mechanism – Parkinson’s disease</td>
<td>Understanding Parkinson’s disease through genetics</td>
<td>Thomas Durcan</td>
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<td>Oct 4</td>
<td>From genes to mechanism – Huntington’s &amp; Parkinson’s disease</td>
<td>Does identification of disease causing mutations produce useful rodent models or treatment strategies emerging from them?</td>
<td>Austen Milnerwood</td>
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<td>Oct 11</td>
<td>Whole exome /genome sequencing in rare neurological disorders</td>
<td>The advantages, limitations and pitfalls of next generation sequencing for rare neurological diseases</td>
<td>Genevieve Bernard</td>
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<td>Oct 18</td>
<td>Targeted next generation sequencing – methodology and uses</td>
<td>The applications, advantages and limitations of targeted next-generation sequencing for rare diseases</td>
<td>Jean-Baptiste Riviere</td>
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<td>Oct 25</td>
<td>ALS</td>
<td>Understanding ALS through the discovery of new genes</td>
<td>Thomas Durcan</td>
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<td>Nov 1</td>
<td>From genes to mechanism – Dementias</td>
<td>Can one mutation cause multiple diseases or does genetic data force a reappraisal of diagnoses? ALS, FTD and the curious</td>
<td>Austen Milnerwood</td>
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<td>Date</td>
<td>Topic</td>
<td>Description</td>
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<td>Nov 8</td>
<td>CRISPR editing case of C9orf72</td>
<td>The good and bad sides of CRISPR genome editing</td>
<td>Thomas Durcan</td>
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<td>Nov 15</td>
<td>Genetic mosaicism in brain disorders</td>
<td>Genetic mosaicism, mechanisms, methods of detection, and implications for neurological diseases.</td>
<td>Jean-Baptiste Riviere</td>
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<td>Nov 22</td>
<td>Genetic models of neurological diseases</td>
<td>Different genetic models and the advantages and disadvantages in neurological diseases.</td>
<td>Ziv Gan-Or</td>
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<td>Nov 29</td>
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