Bio 310: Cellular and Molecular Neuroscience, Fall 2019

Adam Hall: x3467, Ford Hall 202A, ahall@smith.edu.

Office Hrs M 10-11am, F 4-5pm, or by appointment.

Overview

Cellular/Molecular level structure-function in the nervous system.
Topics include: development of neurons, neuron-specific gene expression, receptor cloning, structure/function of ion channels, G-proteins and signal transduction, synaptic machinery, molecular mechanisms of neuronal plasticity and molecular biology of neurological disorders.
4 credits.

Lecture time: T Th 9:25-10:40am, McConnell 102.

Optional textbook: Molecular Neuroscience, by Patricia Revest and Alan Longstaff (BIOS Scientific Publishers Limited)

Schedule

<table>
<thead>
<tr>
<th>DATES</th>
<th>Lectures, Discussions, Presentations,</th>
<th>Readings</th>
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<tbody>
<tr>
<td>Thurs Sept 5</td>
<td>Introduction to course &amp; syllabus</td>
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<tr>
<td>Tues Sept 10</td>
<td>Introduction to Neuronal Development</td>
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<td>Thurs Sept 12</td>
<td>Molecular Control of Neural Development</td>
<td>(Ch.10,11 Hall)</td>
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<td>Tues Sept 17</td>
<td>Process outgrowth and Target Interactions</td>
<td>(Ch.12, Hall)</td>
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<td>Thurs Sept 19</td>
<td>Continued + Discuss Review (#1)</td>
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<td></td>
<td>+ Paper presentation (1)</td>
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<tr>
<td>Tues Sept 24</td>
<td>Neural stem cells and neurogenesis</td>
<td>(TBA)</td>
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<td>Thurs Sept 26</td>
<td>Continued + Paper presentation (2)</td>
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<tr>
<td>Tues Oct 1</td>
<td>Receptor Cloning and Molecular Anatomy of the Nervous System</td>
<td>(Ch. 1, 2 R&amp;L)</td>
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<td>Thurs Oct 3</td>
<td>Continued + Discuss Review (#2)</td>
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<td>Tues Oct 8</td>
<td>Voltage-gated Channel Structure/Function</td>
<td>(Ch.4, R&amp;L)</td>
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<td>Thurs Oct 10</td>
<td>Voltage-gated Channelopathies + Paper presentation (3)</td>
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Tues Oct 15  Autumn Recess
Thurs Oct 17  Ligand-gated Channel Structure/Function  (Ch. 5 R&L)

Tues Oct 22  ACH away at SFN meeting
Thurs Oct 24  MID-TERM EXAM in CLASS

Tues Oct 29  G-proteins and Signal Transduction  (Ch. 6 R&L)
Thurs Oct 31  Continued + Paper presentation (4)

Tues Nov 5  Synaptic Release  (Ch.7, R&L)
Thurs Nov 7  Mechanisms of Plasticity+ Paper Presentation (5)  (Ch.8, R&L)

Tues Nov 12  Continued + Paper Presentation (6)
Thurs Nov 14  Mechanisms of Plasticity continued

Tues Nov 19  Continued + Discuss Review (#3)
+ Paper presentation (7)
Thurs Nov 21  Molecular basis of Neurological Disorders (PD)  (Ch.9, R&L)
+ Paper presentation (8)

Tues Nov 26  Molecular basis of Neurological Disorders (HD)
(Epilepsy essay due in class)
Thurs Nov 28  Thanksgiving recess

Tues Dec 3  Paper presentation (9) + Neurological Disorder (AD)
Thurs Dec 5  Neurological Disorder (AD) Continued
+ Paper presentation (10)

Tues Dec 10  Neurological Disorder (AD) Continued
Thurs Dec 12  Review for final exam
Assignments and Exams:

1) **Paper Presentations** (10%): There will be 8-10 paper (primary literature) presentations (in pairs) throughout the semester. Pairs will select a research article related to the current topic (in bold above), and present it to class for 10-15mins with 5 mins for general discussion. You should include in your presentation an introduction to familiarize the audience with necessary terms, a description of the aims of the research and a concise summary of the results and conclusions. The article must be selected a week before, discussed with AH in office hours and the abstract posted to the class prior to your presentation.

2) Questions on paper presentations (10%). After each student presentation you will receive (by e-mail) a few questions that address the article presented. Complete 5 of these assignments during the semester towards your grade. Each assignment carries 2%.

3) **Review critiques** (15%): 3 review papers/chapters will be read during the course of the semester. A brief critique/short answers on each review will be handed in at each day of class discussion.

4) **Mid-term Exam** (25%): Will consist of short answer questions based on first 4 topics (Development, Gene expression, Receptor cloning, Ion channel Structure/Function)

5) **Paper on a molecular basis of epilepsy** (10%): Each student will research primary articles related to a proposed molecular basis for a chosen form of epilepsy. You will then write a short essay (~3-4 pages, 1.5 spaced) on the research articles describing how the work has influenced our understanding of the disease.

6) **Final Exam** (30%): Comprises of short answer questions on Synaptic Release, Plasticity, Neurological Disorders; and questions based on a research article.

**Review papers/chapters (on Moodle, subject to change):**

1) **Dendritic Arbor Development, Hollis Cline.**
2) **Profiling Brain Transcription, Cao and Dulac.**
3) **Glycine Receptor Channelopathies, Ashcroft (In “ Ion Channels and Disease”)**
4) **Molecular Biology of Memory Storage, Kandel**

**Currently on Library Reserve (subject to change):**

1) **Fundamental Neuroscience (Squire)**
2) **Introduction to Molecular Neurobiology (Hall)**
3) **Molecular Neuroscience (Revest & Longstaff)**
4) **Glycine Receptors, Ashcroft. (In “ Ion Channels and Disease”)**