Psych 3FA3: Neurobiology of Learning and Memory
(2002-2003, Term 2)

Instructor:
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Lab: Room B139, Psychology Building, Tel 905-525-9140 ext. 22022

Weekly Schedule:
Monday, 12:30-13:20 Lecture (ABB 165)
or group discussion (Group 1~5: PC205, Group 6-7: PC311, Group 8~9: PC316)
Tuesday, 13:30-14:20 Lecture (ABB 165)
Thursday, 12:30-13:20 Lecture or in-class presentation (ABB 165)

Virtual Classroom
http://www.learnlink.mcmaster.ca

Course Description
This course will explore the empirical and theoretical bases regarding the neural basis of
learning and memory. The neural mechanisms will be discussed from several perspectives
ranging from cognitive neuroscience to synaptic physiology. Students will attain some
understanding of the rationale and methodology of a variety of strategies that are used in the
investigation of the neural mechanisms underlying learning and memory. The course will start
with a historical perspective and an overview of the multiple memory systems. This model
emphasizes that memory is composed of multiple, separable systems that are associated with
specific neurobiological substrates. A number of brain mechanisms subserving learning and
memory at the systems level, cellular level, and molecular level will then be discussed.

The lectures, student discussion/presentations, in conjunction with required and
supplementary readings, are meant to provide students with both an overview of some of the
currently "hot" areas in the field as well as some basic tools useful in this field. Students are
expected, through active learning (discussion, presentation, and writing critiques), to gain
experience in critically evaluating research literature and in communicating ideas through written
and oral presentations.

During the first few weeks, introductory material will be covered in a traditional lecture
format. In subsequent weeks, for each of the 9 major topic areas (modules), introductory lectures
will be given by the instructor, combined with one hour of student group discussion, and one
hour of class presentations/discussions.

Reading Materials
Required readings: Psychology 3FA3 courseware (available in Campus Bookstore)
Background readings
Supplementary readings
### Evaluation

<table>
<thead>
<tr>
<th>Written Critiques (Total 2)</th>
<th>Marked by</th>
<th>Performance</th>
<th>%</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAs</td>
<td>10</td>
<td></td>
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<tr>
<td>TAs</td>
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<tr>
<td>Presentation</td>
<td>As Primary Presenters</td>
<td>Instructor/TAs/Peers</td>
<td>7.5</td>
<td>15</td>
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<tr>
<td>As Commentator</td>
<td>Instructor/TAs/Peers</td>
<td>7.5</td>
<td></td>
<td></td>
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<tr>
<td>Participation</td>
<td>Peers</td>
<td>Within group</td>
<td>7.5</td>
<td>15</td>
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<tr>
<td></td>
<td>TAs/Instructor</td>
<td>In class/group</td>
<td>7.5</td>
<td></td>
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<tr>
<td>Written Exam</td>
<td>Midterm</td>
<td>TAs</td>
<td>15</td>
<td>15</td>
</tr>
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<td></td>
<td>Final</td>
<td>TAs</td>
<td>25</td>
<td>35</td>
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### Detailed Requirements

The class will be divided into 9 study groups (about 8 students/group). There are 9 topic modules, each with required readings (see courseware) which include one review paper, one or two empirical papers, and (for most modules) a commentary for the empirical paper(s). Each group of students will be assigned a specific task for the 9 topic modules. Each group will have a group discussion about the papers prior to the class presentation, will give presentations in class (as a group) for two modules (one as a primary presenter, the other as a “commentator”) and will write critiques for 2 out of the remaining 7 modules. The content of the critiques should be discussed in groups but the critiques will be written by individual students, not as a group. See below for a complete schedule of which groups will be responsible for which of these tasks for a particular module.

**Group Schedules (Groups 1-9)**

<table>
<thead>
<tr>
<th>Module #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary presenters group #</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Commentators group #</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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### Oral Presentation

- The presentation should be based on the empirical papers listed in each module.
- The primary presenting group should present the basic findings (20-25 minutes).
- The “commentator” group should make comments on the paper (10-15 minutes) and explore the broader issue(s) related to the empirical papers. For the issues to be addressed, this group may follow the guidelines for writing the later part of a critique.
- Each group can elect a few members to give the presentation in class but all group members must participate in the preparation of the presentations and the answering of questions during the presentation.
- Oral presentations will be graded by class based on the content delivered, the logical flow of ideas, and the presentation style.
- For both presenting groups, presentations should incorporate proper audiovisual aids (e.g., Powerpoint slides) and handouts (if necessary). The final version of the presentation slides should be sent to the instructor electronically the day of the presentation (preferably before
the presentation). This will enable the instructor to post the materials on web for other students to preview/review.

Critiques

- For 2 of the 7 modules in which students are NOT involved with the presentation, they are expected to write a critique based on the 1 or 2 empirical papers listed on each module. Students may choose to write critiques for 3 modules. In that case, the TAs will grade the additional critique and the best 2 out of the 3 marked by the TAs will be counted.
- The critique is due at the class time on the day of the presentation. Late critiques will not be accepted.
- See below for detailed instruction for the suggested content of the critique

Participation graded for within group performance by peer group members

- At the end of the term, each member should provide written evaluation on the contribution of each member of the group
- both grades (in terms of %) and written justification should be provided for ALL the aspects of participation (e.g. including intellectual contribution and contribution of time and effort, etc).
- Normally, all group members will be given the same grade for the joint performance in the two presentations, but the instructor reserves the right to use the grades from peer evaluation as a factor to adjust the presentation mark for certain individuals (e.g., those who contribute very little to the joint effort).

Participation graded by instructor/TAs: Participation grades will be given based on the student's performance in the following aspects:

- Attendance in class and at group meetings and punctuality
- Active learning
  - Contribution to class and group discussions
  - Contribution to LearnLink discussions (before or after the presentation)
  - Contribution to literature search (students are encouraged to share suitable articles with the group and class, possibly through Learnlink)
  - Showing initiative in organizing group activities
- Providing extensive and informative feedback to other students on their oral presentation, by completing a very brief evaluation form at the end of each presentation
- Providing feedback and suggestions to the teaching of this course (email to the instructor)

Exams

The written exams (close book) will cover the lecture and required readings materials. Midterm tests can only be written at the times indicated. There can be no make-up tests or special sessions for any student. Students with valid reasons for missing a midterm test must consult the Dean of Studies office for their faculty (e.g. Science or Social Science). If (and only if) there is adequate written justification for missing the test, such students will normally have their grades proportionately reweighted, increasing the relative contribution of the other test and the final exam. The tests and examination will consist of questions short answer and essay questions.
Final grades will be assigned according to the following conventional scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
<th>Letter</th>
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<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
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<tr>
<td>A</td>
<td>85-89</td>
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<tr>
<td>A-</td>
<td>80-84</td>
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<tr>
<td>B+</td>
<td>77-79</td>
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<tr>
<td>B</td>
<td>73-76</td>
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<tr>
<td>B-</td>
<td>70-72</td>
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<tr>
<td>C+</td>
<td>67-69</td>
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<tr>
<td>C</td>
<td>63-66</td>
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<tr>
<td>C-</td>
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<tr>
<td>D+</td>
<td>57-59</td>
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<tr>
<td>F</td>
<td>0-49</td>
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</tbody>
</table>

The instructor reserves the right to adjust final marks up or down, on an individual basis, in light of special circumstances and/or the individual's overall performance in the course.

**Message from the Chair of Psychology**

The instructor cannot be responsible for returning long distance calls from students. Any student wishing to reach an instructor is invited to e-mail the instructor.

**Policy Reminder**

Attention is drawn to the *Statement on Academic Ethics* and the *Senate Resolutions on Academic Dishonesty* as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.

### Topics to be covered and reading schedule

<table>
<thead>
<tr>
<th>week</th>
<th>Lecture and presentation topics</th>
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</table>
| Jan 6    | - Course overview, Organization of study groups  
          | - Introduction to the research ideas, History |
| Jan 13   | - Lecture on the multiple memory systems |
| Jan 20   | - Lecture & presentation on module 1: Multiple memory systems I |
| Jan 27   | - Lecture & presentation on module 2: Multiple memory systems II |
| Feb 3    | - Lecture & presentation on module 3: Sensory Plasticity I: visual system |
| Feb 10   | - Lecture & presentation on module 4: Sensory Plasticity II: auditory system |
| **Feb 17** | **No class - midterm break** |
| Feb 24   | - Lecture & Midterm Exam (tentatively Tuesday, Feb 25) |
| Mar 3    | - Lecture & presentation on module 5: Hippocampus: Spatial learning in humans I |
| Mar 10   | - Lecture & presentation on module 6: Hippocampus: Spatial learning in humans II |
| Mar 17   | - Lecture & presentation on module 7: Hippocampus: place cells |
| Mar 24   | - Lecture & presentation on module 8: LTP I: behavioural approaches |
| Mar 31   | - Lecture & presentation on module 9: LTP II: cellular approaches |
| Apr 7    | - Review and Final Exam Tutorial |
| **Final Exam Period** | **Final Exam** |
Required Reading List (courseware)

Please note the change of the order number in the revised list here. The total number of modules has been changed from 7 (specified in courseware) to 9. Both module 1 and 4 in the courseware has been split into two (I and II) and the order between the two reversed. The order number for all modules should be changed accordingly.

The highlighted items are the review/background papers for the module. For the modules without such papers listed, use the review paper in the previous module.

1. Multiple memory systems I


2. Multiple memory systems II


3. Perceptual learning I: visual system


4. Perceptual learning II: auditory system


5. Hippocampus: Spatial learning in humans I


6. Hippocampus: Spatial learning in humans II


7. Hippocampus: place cells


8. LTP I: behavioural works


9. LTP II: cellular approaches


Guidelines for Psych 3FA3 Critiques

The goal of writing critiques is to allow students to attain a deeper understanding of some of the major issues of the neurobiology of learning and memory and to provide the experience of critically evaluating primary source materials in scientific literature.

Each critique must be written in APA style, typed in 12-point font, and the length should be less than 2 double-spaced pages with 1-inch margins, excluding references. Papers that do not meet these criteria will not be accepted.

Generally, the critique should accomplish two things. First it should try to summarize the important message delivered in the article (half to one page). Second, it should include a discussion of the theoretical implications and the relation to the broader literature.

1. The summary part might include short discussions of
   a. the research issue addressed in the article
   b. the experimental method and hypothesis
   c. whether the empirical findings of the paper support the hypothesis and/or theoretical conclusions

2. The critical analysis could include (but not be limited to) the following
   a. methodological issues
      i. whether the data presented supported the authors' claims as clearly as stated in the article.
      ii. some factors that were not controlled in a study, or other ways in which it was incomplete.
   b. suggestions
      i. further analysis of the data already collected could tell us something more.
      ii. logical alternatives to the authors' explanations of their results
      iii. relevance to theories and phenomena not discussed by the authors
      iv. additional predictions or experiments can come out of the conclusions
      v. related issues that could be studied by similar approaches, etc.
      vi. next steps for the research program
   c. relevance to other studies relating the results to other findings in the literature
      i. relating to the greater theoretical context; how the findings of this paper extend our knowledge of this area of research (why is this study important and interesting?)
   d. cite at least 2 other related references (empirical papers) from the literature other than the primary source paper. Websites, textbooks, and other secondary source materials may be used, but are not sufficient on their own.