Name and Title: Morgan Barense, Associate Professor and Canada Research Chair
Department: Psychology

TITLE OF RESEARCH PROJECT: Why (and How) Does the Brain Forget

Number of 299Y Spots: 3       Number of 399Y Spots: 3

OBJECTIVES AND METHODOLOGY:
Amnesia, meaning loss of memory, can be a devastating consequence of brain damage or disease. Individuals with severe amnesia are unable to form new memories and cannot integrate information from the past to understand the future. As such, they live from moment to moment in an eternal present. Although research has told us much about what areas in the brain are important for forming new memories, we still do not fully understand why people with amnesia forget new information so quickly. Recent exciting findings suggest that there may be a fundamental problem with the way amnesiacs perceive the world around them, and that this deficit in perception may partially underlie their deficit in memory. Students working on this project will investigate this possibility further, and in doing so, will provide new insights into the nature of the amnesic syndrome. In addition, students may have the opportunity to contribute to experiments that are testing novel rehabilitative strategies to alleviate memory loss.

The primary methodology involves computer-based memory tests. During some of the tests, participants’ eye-movements will be simultaneously recorded. Initially the research will be conducted in healthy control populations but will subsequently be adapted for use in patients who have memory disorders and in fMRI neuroimaging experiments.

DESCRIPTION OF STUDENT PARTICIPATION:
Students are considered full members of the laboratory and will have the opportunity to participate in the research project in a number of ways:

1) Students will engage in literature review and discussions regarding memory and perception. ROP students are valuable members of the laboratory and thus regular attendance at lab meetings is required.

2) Students will have the opportunity to contribute to the design of their experiments and will assist with data collection and participant recruitment. Participants may be young adults (e.g., PSY100 students) or older adults recruited through the Adult Volunteer Panel. Opportunities for testing memory-impaired clinical populations may be available.
3) Students will assist with data entry and statistical analysis, which will include training on EXCEL and SPSS. Opportunities for computer programming training (e.g., MATLAB or Python) also exist.

4) Students will gain valuable training in effective scientific communication (e.g., writing research reports, preparing data for publication, and oral presentations).

For all aspects of the project, students will work closely with the faculty supervisor. The skills gained by working on this project will provide important experience to prepare for graduate school and beyond.

**MARKING SCHEME (assignments with weight and due date):**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi-weekly journal and/or documentation of research process. These worklogs are to be emailed to lab manager, direct graduate student or postdoc supervisor, and Prof Barense. We will provide the student with a template. They are due every two weeks.</td>
<td>10%</td>
</tr>
<tr>
<td>First half of term participation in day-to-day lab duties. Active participation in the lab and the specific research project is the most important element of the ROP experience. This is measured by attendance and contribution to weekly lab meetings, and conducting research in an efficient, effective, and professional manner. The grade for this component will be provided to the student by the halfway-point in the term.</td>
<td>20%</td>
</tr>
<tr>
<td>Lab meeting presentation to propose project. This short presentation (approximately 10-15 minutes) will be given during lab meeting and will describe the research the student is planning to conduct. This presentation will be given before the halfway point in the term.</td>
<td>15%</td>
</tr>
<tr>
<td>Lab meeting presentation to describe findings. This short presentation (approximately 10-15 minutes) will be given during lab meeting and will describe the results from the student’s research project. This presentation will be given by the last week of term.</td>
<td>15%</td>
</tr>
<tr>
<td>Final paper. Students will produce a final report (approximately 10 pages) which follows the format of a scientific paper, including an Abstract, Introduction, Methods section, Results section and Discussion. The final paper is due during the exam period.</td>
<td>20%</td>
</tr>
<tr>
<td>Second half of term participation in lab duties. As with lab duties for the first half of term, this includes attendance and contribution to weekly lab meetings, and conducting research in an efficient, effective, and professional manner. In addition, where applicable, it will include the ROP FORUM presentation.</td>
<td>20%</td>
</tr>
</tbody>
</table>
Name and Title: Dr. Daphna Buchsbaum  
Department: Psychology

TITLE OF RESEARCH PROJECT: Computational Models of Cognitive Development

Number of 299Y Spots: 1   Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
In recent years, probabilistic computational models using Bayesian analysis have been successfully applied to a wide range of inference and reasoning problems faced by young children, including word and category learning, cause and effect learning, trust in social informants, and making mentalistic inferences about other’s goals, intentions and beliefs. Probabilistic computational models using Bayesian inference are a natural way to approach understanding how prior biases and different sources of evidence contribute to children’s behavior. The general methodology of this approach is to look at cognition in terms of abstract computational problems, identify the optimal solution to those problems, and compare that solution to human behavior. In particular, the first step involves considering the assumptions and capacities of learners. Bayesian models work by using Bayes’ rule as a normative model of how an idealized learner with some pre-existing expectations or biases about how the world works, can update their beliefs, in light of new data.

DESCRIPTION OF STUDENT PARTICIPATION:
This project is for dedicated and motivated students interested in gaining research skills and experience to help prepare both for future research projects (e.g., thesis) and for graduate school. Students will work closely with the faculty supervisor and lab manager, as well as other lab members and will be involved in all aspects of the research process. Students will be expected to attend and participate in regular (weekly or bi-weekly) lab meetings and to spend approximately 10 hours a week working in the lab.

1) Participating in lab meetings, including discussion of current research issues and projects in the lab, discussion of the theoretical motivations of the models and empirical studies students are working on, and discussion of the findings of other empirical and theoretical papers

2) Assisting with a variety of necessary research tasks in the lab, particularly developing computer-based experiments using Amazon Mechanical Turk and survey software such as Qualtrics, Inquisit, or PsyTurk. This may also involve creating custom web experiments using Javascript and HTML, interacting with SQL databases to retrieve and store data, and writing scripts to preprocess data.

3) Assisting with the development of computational models of cognition. This will include programming (generally in MATLAB, R or Python).
**MARKING SCHEME** (assignments with weight and due date):

**Evaluation of participation in lab work over term.** This includes attendance and contribution to lab meetings, and conducting research in an efficient, effective, and professional manner including consistent attendance and timely completion of programming and experiment design when required. June 3, 2019 and August 1, 2019 40% of total mark.

**Lab Journal.** Students are expected to keep a research journal/work log to record lab activities every week including lab hours, tasks and progress, research ideas, and comments on discussions and assigned articles. In particular, this also includes documentation of experiment and model development, and clearly commented and well-documented code. Journal and interim research report (contained within journal) due June 14, 2019, and whole journal submitted again on August 1, 2019 for grading: 20% of total mark.

**Final Project Report.** Students will prepare a scientific poster for presentation at the annual Faculty of Arts and Science Undergraduate Research Forum in March OR write a final paper (approximately 6-8 pages) in the form of a scientific article (mid-September): 20% of total mark.

**Lab meeting presentations.** Students are expected to give a short (approximately 15 minute) presentation to the lab each term. 20% of total mark.
RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
SUMMER

Name and Title: Dr. Daphna Buchsbaum
Department: Psychology

TITLE OF RESEARCH PROJECT: How Do Social Context and Physical Knowledge Influence Causal Learning In Dogs?

Number of 299Y Spots: 1 Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
All animals live in a causally complex world, where they must learn not only to predict the consequences of events, but also to act causally on the world themselves. How do animals learn these kinds of causal relationships, especially when the world presents them with sparse, ambiguous data or with multiple, conflicting sources of evidence? This ongoing research project builds on previous research with children and monkeys to investigate the causal reasoning abilities of pet dogs. Dogs provide an interesting comparison, because they may have better social cognition skills than monkeys, but poorer understanding of the physical world. To address this, we present pet dogs with a series of puzzle-boxes that dispense treats. Having observed a human demonstrator acting on the puzzle-boxes, dogs have an opportunity to interact with the boxes themselves. The actions that they copy can tell us something about their understanding of cause and effect, and how different social and physical cues influence this. Testing takes place in our lab at U of T and several offsite locations (e.g. dog training facilities).

DESCRIPTION OF STUDENT PARTICIPATION:
This project is for dedicated and motivated students interested in gaining research skills and experience to help prepare both for future research projects (e.g., thesis) and for graduate school. Students will work closely with the faculty supervisor and lab manager, as well as other lab members and will be involved in all aspects of the research process. Students will be expected to attend and participate in regular (weekly or bi-weekly) lab meetings and to spend approximately 10 hours a week working in the lab (or on lab-related tasks). This should include regular availability on at least 1 weekend day every week. Due to the nature of scheduling participants some flexibility is required. Students will participate in the research project in some of the following ways:
1) Participating in lab meetings, including discussion of current research issues and projects in the lab, discussion of the theoretical motivations of the studies students are working on, and discussion of the findings of other empirical papers
2) Assisting with experimental data collection, working and handling with pet dogs
3) Assisting with a variety of necessary research tasks in the lab such as coding video data, stimuli creation, data entry, recruiting and scheduling participants
4) Assisting with data analysis and preparing data for publication

Project Code: PSY 3S
5) Students with a programming background may be given the option of assisting with the development of computational models of cognition and of computer-based experiments

**MARKING SCHEME** (assignments with weight and due date):

**Evaluation of participation in lab work over term.** This includes attendance and contribution to lab meetings, and conducting research in an efficient, effective, and professional manner including consistent attendance and timely completion of programming and experiment design when required. June 3, 2019 and August 1, 2019 40% of total mark.

**Lab Journal.** Students are expected to keep a research journal/work log to record lab activities every week including lab hours, tasks and progress, research ideas, and comments on discussions and assigned articles. In particular, this also includes documentation of experiment and model development, and clearly commented and well-documented code. Journal and interim research report (contained within journal) due June 14, 2019, and whole journal submitted again on August 1, 2019 for grading: 20% of total mark.

**Final Project Report.** Students will prepare a scientific poster for presentation at the annual Faculty of Arts and Science Undergraduate Research Forum in March OR write a final paper (approximately 6-8 pages) in the form of a scientific article (mid-September): 20% of total mark.

**Lab meeting presentations.** Students are expected to give a short (approximately 15 minute) presentation to the lab each term. 20% of total mark.
Name and Title: Dr. Daphna Buchsbaum
Department: Psychology

TITLE OF RESEARCH PROJECT: Are Children Sensitive to Information Received from Others in a Social Learning Task?

Number of 299Y Spots: 1 Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Learning from others is a rich source of information for children, but children must also have strategies to assess the quality of the information they receive. Children are often faced with complex social learning problems, where they receive information from multiple people, who may themselves have shared information, and who may provide information that conflicts with each other, or with the child's own perceptions. In this study, we examine how children learn from groups of people who may differ in the source and quality of their knowledge. This is an important question not only for understanding the mechanisms underlying children's social learning abilities, but also for understanding how and when ideas and behaviours spread through populations, leading to cultural change.

DESCRIPTION OF STUDENT PARTICIPATION:
This project is for dedicated and motivated students interested in gaining research skills and experience to help prepare both for future research projects (e.g., thesis) and for graduate school. Students will work closely with the faculty supervisor and lab manager, as well as other lab members and will be involved in all aspects of the research process. Students will be expected to attend and participate in regular (weekly or bi-weekly) lab meetings and to spend approximately 10 hours a week working in the lab (or on lab-related tasks). This should include regular availability on at least 1 weekend day per week. Due to the nature of scheduling participants some flexibility is required. Students will participate in the research project in some of the following ways:
1) Participating in lab meetings, including discussion of current research issues and projects in the lab, discussion of the theoretical motivations of the studies students are working on, and discussion of the findings of other empirical papers
2) Assisting with experimental data collection, working with young children
3) Assisting with a variety of necessary research tasks in the lab such as stimuli creation (including both physical toys and story books and computer programs and displays), data entry and coding, recruiting and scheduling participants
4) Assisting with data analysis and preparing data for publication
5) Students with a programming background may be given the option of assisting with the development of computational models of cognition and of computer-based experiments

MARKING SCHEME (assignments with weight and due date):
**Evaluation of participation in lab work over term.** This includes attendance and contribution to lab meetings, and conducting research in an efficient, effective, and professional manner including consistent attendance and timely completion of programming and experiment design when required. June 3, 2019 and August 1, 2019 40% of total mark.

**Lab Journal.** Students are expected to keep a research journal/work log to record lab activities every week including lab hours, tasks and progress, research ideas, and comments on discussions and assigned articles. In particular, this also includes documentation of experiment and model development, and clearly commented and well-documented code. Journal and interim research report (contained within journal) due June 14, 2019, and whole journal submitted again on August 1, 2019 for grading: 20% of total mark.

**Final Project Report.** Students will prepare a scientific poster for presentation at the annual Faculty of Arts and Science Undergraduate Research Forum in March OR write a final paper (approximately 6-8 pages) in the form of a scientific article (mid-September): 20% of total mark.

**Lab meeting presentations.** Students are expected to give a short (approximately 15 minute) presentation to the lab each term. 20% of total mark.
Gillian Einstein
Psychology

TITLE OF RESEARCH PROJECT: Attitudes of Undergraduates to Female Genital Cutting

Number of 299Y Spots: 1  Number of 399Y Spots: 1

Objectives and methodologies:
The objective of this study is to gain a better understanding of how undergraduate students perceive female genital cutting (FGC). To carry out this study, a qualitative survey will be created and administered to students in the psychology 100 course. The survey will aim to collect information on what students know about FGC, and what their opinion is on the practice.

Description of student participation:
The student will be trained to carry out and draft literature searches. They will be trained to write an ethics protocol and recruit participants including, explaining the project to them, and asking if they are interested in taking part. The student will also be involved in the creation of the survey measure to be implemented and administering it. The student will gain experience in writing research reports and preparing data for publication. The student will also be involved in the write-up of the data, including additional library research, writing specific papers, as well as reading and commenting on drafts of the paper. Finally, through mandatory attendance at lab meetings (times for which will be established once individual time tables are known) students will learn to ask questions and present their work as well as papers in the literature relevant to their work.

Marking Scheme:
Half the grade (50%) will be based on participation in the lab and the other half, on writing. Participation in the lab includes attendance and contribution to weekly lab meetings (30%). In addition to this, students are expected to give two short (approximately 20 minutes) presentations to the lab (worth 10% each): one on a paper relevant to their part of the project and one to present their project’s findings. Writing assignments include keeping a journal outlining progress on the project and any pitfalls as well as solutions (20%). Finally, students are expected to produce a final report (approximately 8 pages) using the format of a scientific paper, including an Introduction, Methods section, Results section and Discussion due at the end of the term (worth 30%).
DUE DATES:
Lab Meetings: Every week throughout the term
Presentation 1: June 14 (within the last 3 weeks)
Presentation 2: August 12 (within the last 3 weeks)
Lab Journal: June 14 & August 12 (for one full grade)
Final report: August 12
Name and Title: Gillian Einstein
Department: Psychology

TITLE OF RESEARCH PROJECT: Interaction of Genes, Estrogens and Memory

Number of 299Y Spots: 1  Number of 399Y Spots: 1

Objectives and methodologies:
The objective of this study is to gain a better understanding of how genes interact with estrogens to affect memory. Both menopausal women and women on hormonal birth control will be recruited and their memories tested using neuropsychological tasks. Estrogens will be measured or taken into account depending on menstrual phase. Saliva will be collected for the analysis of relevant genes. The data analysis will determine possible correlations between genes, memory, and hormonal status.

Description of student participation:
The student will be trained to carry out and draft literature searches. The student will also be involved in the analysis and write-up of the data, including additional library research, as well as reading and commenting on drafts of the paper. The student will gain experience in analyzing data, writing research reports and preparing data for publication. Finally, through mandatory attendance at lab meetings (times for which will be established once individual time tables are known) students will learn to ask questions and present their work as well as papers in the literature relevant to their work.

Marking Scheme:
Half the grade (50%) will be based on participation in the lab and the other half, on writing. Participation in the lab includes attendance and contribution to weekly lab meetings (30%). In addition to this, students are expected to give two short (approximately 20 minutes) presentations to the lab (worth 10% each): one on a paper relevant to their part of the project and one to present their project’s findings. Writing assignments include keeping a journal outlining progress on the project and any pitfalls as well as solutions (20%). Finally, students are expected to produce a final report (approximately 8 pages) using the format of a scientific paper, including an Introduction, Methods section, Results section and Discussion due at the end of the term (worth 30%).

DUE DATES:
Lab Meetings: Every week throughout the term
Presentation 1: June 14 (within the last 3 weeks)
Presentation 2: August 12 (within the last 3 weeks)
Lab Journal: June 14 & August 12 (for one full grade)
Final report: August 12
RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
SUMMER

Name and Title: Gillian Einstein
Department: Psychology

TITLE OF RESEARCH PROJECT: Sleep Disturbance Following Natural or Surgical Menopause

Number of 299Y Spots: 1 Number of 399Y Spots: 1

Objectives and methodologies:
The objective of this project is to better understand the effects of hormones on sleep in menopausal women. Sleep disturbance is commonly reported following natural menopause, and while loss of ovarian hormones has been implicated in this symptom, the different facets of sleep impacted by hormone loss is poorly understood. Additionally, while women that undergo early surgical menopause report more severe sleep disruptions than those that go through natural menopause, no study has compared menopause type on sleep using polysomnography. For this study, sleep measures will be collected from women without their ovaries and compared to women of the same age who still have their ovaries but went through natural menopause. Polysomnography, which involves collecting physiological measures of brain activity, breathing and heart rate while participants sleep will be used to measure sleep architecture (e.g. sleep stages) and arousability during the night. Since sleep impacts memory, this project will also involve examining the association between sleep disruption and performance on memory tests.

Description of student participation:
The student will be trained to carry out and draft literature searches. They will be trained to contact prospective control participants from an established list of potential participants, explain the project to them, and ask if they are interested in taking part. Given the students’ level of maturity and interest, they may also be trained to administer cognitive tests to the non-clinical populations. The student will assist with sleep scoring according to the American Academy of Sleep Medicine (AASM) guidelines, data entry and statistical analysis using Excel and SPSS. The student will gain experience in writing research reports and preparing data for publication. The student will also be involved in the write-up of the data, including additional library research, writing specific papers, as well as reading and commenting on drafts of the paper. Finally, through mandatory attendance at lab meetings (times for which will be established once individual time tables are known) students will learn to ask questions and present their work as well as papers in the literature relevant to their work.

Marking Scheme:
The majority of the grade (50%) will be based on participation in the lab. This includes attendance and contribution to weekly lab meetings, and keeping a journal outlining progress on the project and any pitfalls as well as solutions.
In addition to this, students are expected to give two short (approximately 20 minutes) presentations to the lab (worth 10% each): one on a paper relevant to their part of the project and one to present their project’s findings. Finally, students are expected to produce a final report (approximately 8 pages) using the format of a scientific paper, including an Introduction, Methods section, Results section and Discussion due at the end of the summer term (worth 30%).

**DUE DATES:**

Lab Meetings: Every week throughout the term  
Presentation 1: June 14 (within the last 3 weeks)  
Presentation 2: August 12 (within the last 3 weeks)  
Lab Journal: June 14 & August 12 (for one full grade)  
Final report: August 12
Name and Title: Gillian Einstein
Department: Psychology

TITLE OF RESEARCH PROJECT: Changes in the Volume of the Amygdala Following Surgical Menopause.

Number of 299Y Spots: 1

Objectives and methodologies:
The experiment for this ROP project is part of a larger study examining how cognition and the brain are affected by ovarian hormones. This study examines a group of women who carry a genetic mutation (BRCA1/2) which puts them at an elevated risk for developing breast and ovarian cancer. To reduce this risk these women are counselled to have their ovaries removed by the age of 40, which means that they have low levels estrogen. These women are compared to women who still have their ovaries to better understand the effect of estrogen on cognition, mood, and the brain. Data is collected on cognitive performance, mood, and anxiety using standardized tests and self-report measures, and MRI scans are obtained to examine brain structure.

The specific experiment proposed here uses data from this cohort to examine changes in mood and the brain following loss of estrogen. Evidence suggests that estrogens are important for emotional processing, as reductions in estrogen are associated with increased symptoms of depression and anxiety. The neurobiological mechanisms through which estrogen affects mood is not well understood. Both rodent and human research suggest that loss of estrogens can affect the hippocampus which could contribute to estrogen’s effect on mood. However, one recent study suggests that estrogen might also affect the amygdala, a region of the brain known for processing emotion. The goal of this project is to determine whether there are changes in the structure of the amygdala following loss of estrogen, whether any change in the amygdala is related to self-report measures of mood or anxiety, and whether estrogen-based hormone therapy following surgery prevents changes in the amygdala.

Description of student participation:
A student working on this project is expected to be an active member of the lab, attending all lab meetings and completing their work at the lab whenever possible. This provides students with the opportunity to get advice on their project, but also be exposed to the variety of research that is being done in the Einstein lab. Students are encouraged to take part in discussions at lab meetings and are welcome to volunteer on project besides their own if that interests them.
For this specific project there are some specific tasks that the student will be expected to complete:

1) A literature review to familiarize themselves with background research that is directly related to their project. This work will contribute to both the interim and final reports that the student will be graded on.
2) Familiarize themselves with data collection techniques, including attending an MRI testing session to see how we acquire the data they are analyzing.
3) Quality control all analyzed MRI images to ensure that the automated pipeline accurately identified the amygdala for all participants. This will involve training on Display (software used to analyze MRI data).
4) Help with data analysis to compares the volume of the amygdala between experimental groups, and correlate amygdala volume with measures of mood and anxiety. This will involve training on Excel and SPSS.
5) Write a short paper on this experiment including a literature review, a description of the methods used, and the results obtained.

Students will work closely with a postdoctoral fellow in the lab to ensure that they have the support they need as they complete the different tasks required for their project. Participating in this project will prepare them for future research experiences and is ideal for students who are interested in neuroscience/neuroimaging techniques.

Marking Scheme:
The majority of the grade (50%) will be based on participation in the lab. This includes attendance and contribution to weekly lab meetings, and keeping a journal outlining progress on the project and any pitfalls as well as solutions. In addition to this, students are expected to give two short (approximately 20 minutes) presentations to the lab (worth 10% each): one on a paper relevant to their part of the project and one to present their project’s findings. Finally, students are expected to produce a final report (approximately 8 pages) using the format of a scientific paper, including an Introduction, Methods section, Results section and Discussion due at the end of the summer term (worth 30%).

DUE DATES:
Lab Meetings: Every week throughout the term
Presentation 1: June 14 (within the last 3 weeks)
Presentation 2: August 12 (within the last 3 weeks)
Lab Journal: June 14 & August 12 (for one full grade)
Final report: August 12
RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
SUMMER

Name and Title: Dr. Michael Mack (Assistant Professor)
Department: Psychology

TITLE OF RESEARCH PROJECT: The Mutual Interaction of Attention and Memory in Category Learning

Number of 299Y Spots: 1                                  Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
How do we learn effectively such that knowledge is not only retained for the long term, but can also be flexibly adapted when learning goals change? Answering this question requires understanding a number of core cognitive processes: attending to key information, evaluating sampled information in light of prior knowledge stored in memory, and updating knowledge with new information. By integrating the neuroscience of memory and attention with formal psychological learning models, our lab is investigating both how attention is guided by prior knowledge in new learning and how new conceptual knowledge is formed through the interaction of attention and memory. Experimental studies in the Mack Lab target both of these questions by asking how the neural machinery of attention is tuned during successful learning and how memory structures in the brain are influenced by dynamic learning goals in forming new knowledge. Our lab utilizes a combination of behavioural, eye-tracking, and neuroimaging paradigms, as well as mathematical modeling.

DESCRIPTION OF STUDENT PARTICIPATION:
The Mack Lab is looking for motivated students who are interested in gaining research skills in computational cognitive neuroscience. Programming experience and computational skills are preferred but not mandatory. Depending on prior experience, students may be involved in a variety of tasks:

1. Developing stimuli for experiments
2. Assisting with preparing experimental scripts for online experiments
3. Assisting with data collection for behavioural, eye-tracking, and neuroimaging experiments
4. Assisting with analyzing behavioural, eye-tracking, and neuroimaging data
5. Writing research reports
6. Attending and participating in regular lab meetings

Students are expected to spend approximately 10 hours per week in lab working on research tasks. Students will gain experience with experimental and statistical software, such as Matlab, Python, R, Inquisit, and learn how to run behavioural and eye-tracking experiments.

MARKING SCHEME (assignments with weight and due date):
Final marks will depend on four factors:
1. **In-lab participation and work**: Students’ overall research performance will be evaluated according to attendance and participation in lab meetings, efficient and timely completion of assigned research tasks, and professional conduct. July 1, 2019 and August 15, 2019; 40% of total mark.

2. **Lab journal**: Students are expected to keep a weekly log of their research in a lab notebook hosted on the lab’s Basecamp account. The notebook should document all experimental design and analysis decisions, as well as updates on data collection. The lab journal, with an interim progress report included in the journal, should be turned in on July 1, 2019. The journal should be submitted again on August 15, 2019; 20% of total mark.

3. **Final project report**: Students will prepare a scientific poster for presentation at the annual Faculty of Arts and Science Undergraduate Research Forum in Spring 2020 OR write a final paper (approximately 6-8 pages) in the form of a scientific article. Either option is due August 15, 2019. 20% of total mark.

4. **Lab meeting presentations**: Students are expected to give a short (approximately 15 minute) presentation during lab meeting by August 15, 2019. 20% of total mark.
Name and Title: Nick Rule  
Department: Psychology  

TITLE OF RESEARCH PROJECT: Social Perception and Cognition  

Number of 299Y Spots: 3  Number of 399Y Spots: 3  

OBJECTIVES AND METHODOLOGY:  
People form impressions of each other in just a fraction of a second. Even cues as minimal as isolated, individual facial features (e.g., a pair of eyes) are enough to allow one to judge a great deal of information about a person. This project explores various phenomena related to how it is that we quickly and accurately form impressions about other people. Students will work on computer-based and interpersonal interaction experiments in which we will collaboratively work to understand the cues related to judgments of others’ group membership and career success. Some tests will involve monitoring participants’ eye-movements during their perceptions or measuring their physiological responses (possibly including fMRI). A particular emphasis will be given to the role of cultural differences in judgment and perception.  

DESCRIPTION OF STUDENT PARTICIPATION:  
Students will have the opportunity to participate in the research project in a number of ways:  

1) Students will engage in literature review and discussions regarding social perception and cognition. Attendance at regular lab meetings to learn about other research being conducted is the lab is required.  
2) Students will assist with experimental design and preparation, which will include training in Photoshop and related stimulus-generation graphics programs.  
3) Students will assist with data collection and recruitment of participants from the psychology department’s participant pool, as well as the greater Toronto community.  
4) Students will assist with data entry and statistical analysis, which will include training on any or all of EXCEL, SPSS, and R.  
5) Students will gain experience in writing research reports and preparing data for publication. The student will be involved in the write-up of data, including additional library research, writing specific sections of the paper, as well as reading and commenting on drafts of the paper.  
6) For all aspects of the project, students will work collaboratively with other lab members (graduate students, post-docs, research assistants, lab manager, and principal investigator). The skills gained by working on this project will provide important experience to help prepare both for future research projects (e.g., thesis) and for graduate school.
MARKING SCHEME (assignments with weight and due date):
The majority of the grade will be based on participation in the lab. This includes attendance and contribution to weekly lab meetings, and conducting research in an efficient, effective, and professional manner; as documented via 24 weekly reports worth 3% each (12 reports in Summer worth 6% each). In addition to this, students are expected to give two short presentations to the lab (worth 8% each): one to propose the project by the last day of classes in the first term semester and one to present the project’s findings by the last day of classes in the second term. Finally, students are expected to produce a final report (approximately 8 pages), which follows the format of a scientific paper, including an Introduction, Methods section, Results section and Discussion (worth 12%) due no later than the last day of classes in the second term.

May 10 – Report 1 due
May 17 – Report 2 due
May 24 – Report 3 due
May 31 – Report 4 due
June 7 – Report 5 due
June 14 – Report 6 and Proposal Presentation due
July 5 – Report 7 due
July 12 – Report 8 due
July 19 – Report 9 due
July 26 – Report 10 due
August 2 – Report 11 due
August 9 – Report 12 due
August 12 - Final Presentation and Final Paper due
Name and Title: Dr. Meg Schlichting, Assistant Professor
Department: Psychology

TITLE OF RESEARCH PROJECT: How Does the Developing Brain Remember?

Number of 299Y Spots: 1  Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Recent research suggests that in the healthy young adult brain, related memories can become connected to form so-called integrated memories that span specific experiences. These memories are supremely flexible in that they can support our ability to make new decisions that do not depend on just one isolated experience; yet, they might also distort our experiences by pulling together or pushing apart memories according to their complex relationships. How and when in development does this tendency emerge? Due to immaturity of the underlying brain structures (including most notably the hippocampus and prefrontal cortex), it might be the case that memories formed by children and adolescents are qualitatively different from those formed by adults—namely, memories might go from being rigid but veridical in childhood to flexible yet distorted in adulthood. The proposed research project will further investigate this possibility, lending key insights into how the nature of memories might shift over the course of development.

The primary methodology involves computer- and paper-based tasks in which we will measure participants’ accuracy, response time, and/or mouse movements to assess their memory. Initially some research will be conducted in young adults, and will subsequently be adapted for use in children or adolescents and/or for brain imaging experiments (functional/structural MRI or NIRS).

DESCRIPTION OF STUDENT PARTICIPATION:
We are looking for ambitious and dedicated students who are looking to gain hands-on research experience in a developmental cognitive neuroscience laboratory. Students will dedicate 10 hours per week to lab-related work, and should have regular availability on at least one weekend day. Due to the fluctuating demands of participant scheduling and testing, some flexibility in hours is desirable. Students will work closely with their research mentor (e.g., a graduate student, postdoctoral fellow, advanced undergraduate or lab manager) and/or the faculty supervisor and be involved in various stages of the research process, including some of the following activities:

1) Participating in lab meetings, including discussion of the student’s research focus in the lab, discussion of other projects and research issues in the lab, and discussion of theoretical questions and the findings of empirical papers.
2) Recruiting and scheduling child, adolescent, and adult participants in experiments and assisting with behavioural and/or MRI data collection. It is highly desirable that interested students are comfortable working with children and adolescents.

3) Contributing to experimental design, data analysis, and results interpretation.

4) Developing computer programming skills (e.g., using MATLAB or Python) by creating experimental tasks and/or analyzing data. Some students may gain exposure to fMRI data analysis packages. Prior computer programming experience is preferred but not mandatory.

5) Gaining valuable scientific communication skills by writing research reports, preparing data for publication, and giving oral presentations.

MARKING SCHEME (assignments with weight and due date):

**Lab participation (40%)**: A substantial portion of the grade will be based on participation in the lab. This includes attendance and contribution to weekly lab meetings, and conducting research in an efficient, effective, and professional manner. Students will be expected to keep a weekly log of hours and activities, to be turned in to the faculty supervisor for grading halfway through, deadline July 1, 2019 and at the end of the program, deadline August 15, 2019. Students will receive regular feedback as to their performance in the lab through individual meetings with the faculty supervisor.

**Midterm report (10%)**: Students will write a 2-page midterm report detailing their research experience up to this point by the deadline July 1, 2019.

**Presentation (20%)**: Students will give a 20-minute presentation of the project findings at lab meeting by the deadline August 15, 2019.

**Final project (30%)**: Students will either prepare a scientific poster for presentation at the annual Faculty of Arts and Science 299 Research Fair OR write a final paper (approximately 6-8 pages) in the form of a scientific article. The paper should include Introduction, Methods, Results, and Discussion sections. Turn in your poster or paper via email to the faculty supervisor by the deadline August 15, 2019.
Name and Title: Christina Starmans, Assistant Professor
Department: Psychology

TITLE OF RESEARCH PROJECT: Children’s Understanding of Moral Conflict and Temptation

Number of 299Y Spots: 1  Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
We all make numerous moral decisions every day. Some of these decisions are so easy they barely register as choices. Without much thought, we easily help our loved ones, stop at red lights, and refrain from murder. Other moral decisions are more difficult. We often know the right thing to do, and part of us wants to be that good person, but we also feel tempted to do the wrong thing: to cheat on our taxes or our spouses, lie to avoid trouble, or to skip out on a promise. Who is the better person: the one who acts morally while tempted or the one whose heart is pure?

In a series of ongoing studies, we are investigating children’s and adults’ moral reasoning about inner conflict and temptation. The experience of inner moral conflict is a core component of moral behavior and moral judgment. If people were not both tempted to act immorally, and motivated to act morally, there would be little need for society to develop a moral framework, or for humans to have evolved a moral psychology. Thus, a complete understanding of moral reasoning will require a thorough understanding of how the internal struggle between the desire to act morally and the temptation to act immorally affects moral judgments.

DESCRIPTION OF STUDENT PARTICIPATION:
This project is for dedicated and motivated students interested in gaining research skills and experience to help prepare both for future research projects (e.g., thesis) and for graduate school. Students will work closely with the faculty supervisor and other lab members and will be expected to attend and participate in regular lab meetings and to spend approximately 10 hours a week working in the lab (or on lab-related tasks). This should include regular availability on at least 1 weekend day per week. Students will participate in the research project in some of the following ways:
1) Participating in lab meetings, including discussion of current research issues and projects in the lab, discussion of the theoretical motivations of the studies students are working on, and discussion of the findings of other empirical papers
2) Assisting with experimental data collection, working with young children
3) Assisting with a variety of necessary research tasks in the lab such as stimuli creation (including both physical props and story books and computer programs and displays), data entry and coding, recruiting and scheduling participants

Project Code: PSY 12S
4) Assisting with data analysis and preparing data for publication
5) Assisting with the development of online computer-based experiments

Desirable Skills and Experience. Students should be enthusiastic and self-motivated, able to pay attention to fine
details, and comfortable interacting with both children and adults. In order to accommodate the schedules of parents
and children, students will need to have blocks of 3-4 hours at a time regularly available for research during day time
hours (weekdays and weekends). Experience working with children either formally or informally is highly desirable.

MARKING SCHEME (assignments with weight and due date):
Lab participation& journal (40%). This includes attendance and contribution to lab meetings, and conducting
research in an efficient, effective, and professional manner. To monitor progress, students are expected to keep a
research journal/work log to record lab activities every week including lab hours, tasks and progress, research ideas,
and comments on discussions and assigned articles. This journal will be submitted every two weeks. The student will
receive regular feedback as to his/her performance in the lab.
Literature Review Spreadsheet (20%). Students will contribute on an ongoing basis to a literature review
spreadsheet listing and briefly summarizing articles relevant to the experiments they are involved with. Final
submission August 15, 2019
Lab meeting presentations (20%). Students are expected to give two short (approximately 15 minute) presentations
to the lab each term.
Final Project Report (20%). Students will prepare a scientific poster for presentation at the annual Faculty of Arts and
Science 299 Research Fair OR write a final paper (approximately 6-8 pages) in the form of a scientific article. August
15, 2019.
RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
SUMMER

Name and Title: Christina Starmans, Assistant Professor
Department: Psychology

TITLE OF RESEARCH PROJECT: What Aspects of Self-Contribute to Moral Rights and Responsibilities?

Number of 299Y Spots: 1 Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Humans are often given an elevated moral status compared to other entities like animals or robots. Killing a human is usually seen as worse than killing an animal, and owning animals comes with greater responsibility than owning robots. However, there has long been debate amongst philosophers and legal scholars regarding the basis for these judgments and the extent to which they are correct. The objective of this line of research is to investigate how attributing various aspects of a self to an entity affects the moral rights and responsibilities afforded that entity, as well as investigating the developmental origins of reasoning about moral status.

DESCRIPTION OF STUDENT PARTICIPATION:
This project is for dedicated and motivated students interested in gaining research skills and experience to help prepare both for future research projects (e.g., thesis) and for graduate school. Students will work closely with the faculty supervisor and other lab members and will be expected to attend and participate in regular lab meetings and to spend approximately 10 hours a week working in the lab (or on lab-related tasks). This should include regular availability on at least 1 weekend day per week. Students will participate in the research project in some of the following ways:

1) Participating in lab meetings, including discussion of current research issues and projects in the lab, discussion of the theoretical motivations of the studies students are working on, and discussion of the findings of other empirical papers
2) Assisting with experimental data collection, working with young children
3) Assisting with a variety of necessary research tasks in the lab such as stimuli creation (including both physical props and story books and computer programs and displays), data entry and coding, recruiting and scheduling participants
4) Assisting with data analysis and preparing data for publication
5) Assisting with the development of online computer-based experiments

Desirable Skills and Experience. Students should be enthusiastic and self-motivated, able to pay attention to fine details, and comfortable interacting with both children and adults. In order to accommodate the schedules of parents and children, students will need to have blocks of 3-4 hours at a time regularly available for research during day time...
hours (weekdays and weekends). Experience working with children either formally or informally is highly desirable.

**MARKING SCHEME (assignments with weight and due date):**

**Lab participation & journal (40%).** This includes attendance and contribution to lab meetings, and conducting research in an efficient, effective, and professional manner. To monitor progress, students are expected to keep a research journal/work log to record lab activities every week including lab hours, tasks and progress, research ideas, and comments on discussions and assigned articles. This journal will be submitted every two weeks. The student will receive regular feedback as to his/her performance in the lab.

**Literature Review Spreadsheet (20%).** Students will contribute on an ongoing basis to a literature review spreadsheet listing and briefly summarizing articles relevant to the experiments they are involved with. Final submission August 15, 2019

**Lab meeting presentations (20%).** Students are expected to give two short (approximately 15 minute) presentations to the lab each term.

**Final Project Report (20%).** Students will prepare a scientific poster for presentation at the annual Faculty of Arts and Science 299 Research Fair OR write a final paper (approximately 6-8 pages) in the form of a scientific article. August 15, 2019.
RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
SUMMER

Name and Title: Kaori Takehara-Nishiuchi
Department: Psychology

TITLE OF RESEARCH PROJECT: Enhancement of Event-Location Memory in Rats

Number of 299Y Spots: 1 Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Memory of daily experiences (episodic memory) depends on the ability to associate events (what) in time (when) and space (where). Past research in humans and animals showed that this ability depends on many brain regions, including the hippocampus and medial prefrontal cortex (mPFC). Our research group recently found that by manipulating the activity level of mPFC during experiences, we were able to help rats to learn the association between two events separated in time. This project will test whether the same manipulation can enhance the association of events with locations. To this end, we will apply an advanced genetic manipulation that allows for enhancing the activity of brain cells for a few hours and then test its impact on rats’ behaviour during a context-guided event-location task. In this task, rats need to learn which of two odour cues signal food reward depending on which of two rooms they are in. After the completion of behavioural testing, we will validate the manipulation with histological techniques.

DESCRIPTION OF STUDENT PARTICIPATION:
The students will be involved in the project in five ways:
1) Literature review on the topic area
2) Handling rats
3) Behavioural testing of rats
4) Immunohistochemistry
5) Cell counting

Be aware that this project involves daily contact with live rats.

MARKING SCHEME (assignments with weight and due date):
Participation (daily experiments and biweekly lab meeting) 25%
Literature review (5 pages) 20% (June 1st)
Mid-term report (5 pages) 20% (July 1st)
Final report (10 pages) 35% (August 18th)