CAPS 200 Outline & Schedule 2018W

This course will introduce you to the concepts and essential skills in biomedical research. You are required to explore scientific literature on your own and discuss your findings and understanding with your peers as we deconstruct research seminars given by two UBC research scientists. You will be guided to think critically and creatively in the process using problem sets and group discussion facilitated by your instructors. The goal is to enable you to summarize the seminar content in written form and craft a research proposal in format of a ten-minute presentation, which you be required to make in front of the class at the end of term before the university scheduled examination period. There are no examinations in this course. The time you would normally spend studying and preparing for exams is spend outside of class accumulating knowledge required to enable you to discuss, analyze and synthesize ideas. In order to succeed you must begin this process right away.

I hope you enjoy this challenging course and use the opportunity to transform your understanding of scientific research and the underlying process that allows us to create new knowledge. I am keen to hear about your experiences and open to your feedback throughout the course. Do not hesitate to discuss your concerns, suggestions and Aha (!) moments with me.

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Learning Outcomes

Overarching Learning Outcomes

By the end of the course the students will be able to:

1. Communicate effectively the thought process, logic, motivation, techniques and impact of a high profile current research seminar in cellular, anatomic and physiological sciences.

2. Examine primary research-based literature focusing on the underlying questions, experimental approach, results and significance of the scientific findings and be able to articulate these in discussion sessions.

3. Formulate a research question designed to test refine and build on theories presented in class and a logical plan for data analysis as part of a research proposal for a summer directed studies.

Content Learning Outcomes

Seminar 1: Dr. Haas How Do Brain Neurons Grow And Form Functional Neural Networks

1. Define the critical period and describe how neurons grow during early development and which factors are considered important in the growth of neuronal circuitry.
2. Describe the relationship between synapse formation and dendritic growth.
3. Discuss the advantage of targeted single cell electroporation and Fast AOD two-photon microscopy when assessing dendridic arbor growth.

4. Explain how visual experience affects dendritic and axonal growth and how synaptic plasticity is measured in the Haas lab using two-photon fluorescence microscopy, calcium imaging and dynamic morphometrics of the visual circuit in the developing albino tadpole.
5. Describe the advantage of using in-vivo imaging and explain the mechanisms of LTP and LTD.
6. Define metaplasticity and describe evidence from the Haas lab supporting this theory.

Seminar 2 Dr. Bamji: Activity-Dependent Trafficking of Synaptic Proteins

1. Distinguish between LTP and LTD. Describe the underlying molecular mechanisms associated with LTP and LTD.
2. Compare and contrast different methodologies for inducing LTP in the tadpole in vivo model versus the hippocampal culture in vitro model.
3. Explain why the primary hippocampal culture is a good system to study molecular events and synaptic plasticity. Describe the advantages of using embryonic cells for hippocampal culture.
4. Describe the landmark studies that led to our current understanding of synaptic plasticity.
5. Explain why post-translational modification is important for synaptic proteins. Compare and contrast palmitoylation to other post-translational modifications.

Assessment

This course is graded numerically out of 100. Marks are distributed as follows:

Preparation & Participation	20%
4 Problem Sets:	40%
2 Seminar Summaries:	20%
Proposal Presentation:	20%

Assignment due dates 2019

January 24	Problem Set 1
February 7	Seminar 1 Summary
February 14	Problem Set 2
March 7	Problem Set 3
March 14	Seminar 2 Summary
March 26	Problem Set 4
Apr 2 & 4	Proposal Presentations

All **problem sets** and **seminar summaries** must be submitted **online** by **noon** to **Canvas pdf file form. Late** submissions will receive a **50% reduction in mark.**

PREPARATION & PARTICIPATION is based on completion & quality of journal assignments available on Canvas AND participation in class discussion. **Journals are due at the beginning of each session**. You **must bring one paper copy of your journal entry to the class for the instructor** and another copy for your use during discussion sessions with your peers. Meaningful participation of individual students in this course is key to success. Classroom discussions are based on the content of your journal. Journals also serve as an excellent guiding tool helping you in formulating your research proposal.

Complete the journal in short, point form sentences as means to share your findings, questions, and analysis with peers and faculty. Content of all video assigned material should be compiled in a single section. Reading materials must be cited. See below for the formatting of a journal sample by a student reading their very first scientific article on a biomedical subject. With time your entries will be more specific and refined compared to the simple example below. **Journals should not exceed 1 single spaced page, and must follow the format below**. **No marks will be given for journals exceeding this limit and failure to provide a paper copy at the beginning of the session.**

Journal

Reading

Haas K, et al. Targeted electroporation in Xenopus tadpoles in vivo: from single cell to the entire brain. Differentiation **70**, 148-154 (2002)

Key Points

1. rapid identification of genes is outpacing ability of scientist to identify the role of genes in cell function. Creating transgenic organisms is expensive, time consuming and limited to a few species.
2. electroporation is a versatile method allowing multiple genes to be introduced into the same cell via different plasmids, leaving behind little delivery agent to cause cell damage.
3. paper discusses adaptation of current electroporation techniques for neurons at both ends of scale: large regions of the brain and single cell.

Questions that needs discussion with my peers and can use further research on my own.

1. This is a technique paper. I will likely learn more by doing. I get the general idea of SCE and its benefits; what I am wondering is how does two-photon microscopy work and why it is preferred to other forms of microscopy?
2. What exactly is fluorescence?
3. Has anyone followed up to see if morpholino oligoneucleotides introduced this way can interfere with mRNA translation?

Implications for my proposal

1. Explore feasibility of such technique as it relates to my research question.
2. Details of electroporation technique that I need to consider for my research methods.

Videos

Key Points

1. Scientists interested in the basic question, how bacteria protect themselves from viruses?, discovered the bacteria's ability to selectively splice DNA which ended up in a powerful technique in shining light into seemingly unrelated by important research, the treatment of diabetes though effective production of insulin.
2. Science funding is decreasing at an alarming rate in the US

Questions that needs discussion with my peers and can use further research on my own.

1. How can scientists communicate the value and importance of their work so that the general public appreciates the need for funding of basic research in contrast to the general public bias for research into cures and treatment of diseases?
2. How can I find out about the funding of basic science in Canada and the trends in the past two decades since I was born?
3. How many of my peers have/know about the bias stated in question 2, have discussed it with their friends and family, what is their opinion? How do I see it?

Implications for my proposal

1. My proposal does not, and likely should not, try to answer a question related to a specific disease, instead I should focus on the basic scientific question that make me curious and is rooted in an effort to understand a basic mechanism of how a system is operating.

PROBLEM SETS are designed to help you develop a greater understanding of key concepts, think creatively and guide group discussions. **Answers to each question should not exceed 300 words.** An additional single page of reference list for material consulted must accompany the problem set answers. Use the **reference style** required by the journal Nature. See the following link: http://www.citethisforme.com/guides/nature/how-to-cite-a-journal

SEMINAR SUMMARIES characterize your understanding of the research seminars. Describe the rationale for the research, research questions, experimental approaches, results, conclusions and significance of the findings. Pay close attention to the rubric below for assessment. You should conclude the summary with a minimum of two research questions for the Q&A session with the seminar speaker. If you have more than two meaningful questions, it would be stellar. **Seminar summary should not exceed 1200 words.**

Category	Outstanding	Meets Standards	Below Standards	Incomplete	%
Introduction	1 engaging, thought provoking; states the main topic of the seminar; previews the structure of the seminar; a clear & concise description of the research questions presented in the seminar	0.75 states the main topic of the seminar, an incomplete preview of seminar structure, research questions	0.5 an unfocused introduction with incomplete preview of seminar structure, research questions	0	1
Experimental Approach & Results	3 clear, concise & accurate description of the methods, explanation of the results	2 clear &accurate description of the methods & results	1 methods & results are stated but are not clear, inaccurate	0	3
Significance	3 engaging, thought-provoking, succinct explanation about significance of the research and its future directions	2 clear & concise statement about the significance of the research	1 statement about significance of research is unclear or inaccurate	0	3
Questions	3 2 or more clear, concise questions based on findings presented in the seminar & those garnered outside the seminar	2 2 questions based on the findings presented by the seminar speaker	1 a single question related to the seminar topic	0	3

RESEARCH PROPOSAL Present a proposal for a potential summer research project based on the research material explored in one of the seminars in the course. Students will be randomly assigned to one of the two seminar topics on the first week of class. Seminar speakers will assess your proposal. This ten-minute presentation will be followed by a five minute Q&A period. Please pay close attention to the following assessment criteria used for your proposal presentations.

Research Proposal Assessment Criteria	Mark
Format (adheres to the following format) • Single descriptive title slide. • Introduction (2 slides) • Question/Hypothesis/Specific Aims (2 slides) • Research Plan (1-2 slides) • Significance (1 slide) • References (1 slide) same style as journal	1
Introduction 1. Context: provides a summary and review of current literature (2) 2. Literature selected includes at least 2 -3 articles not reviewed in the course. (1) 3. Identifies the gaps, problems or issues unresolved by the literature. (1)	4
Statement of Problem or Question (1 mark per item) 1. States a clear, concise compelling research question (1 marks) 2. Provides a testable hypothesis (1 mark) 3. States the specific aims of the study (1 marks)	3
Methodology-Research Plan (2 marks per item) 1. Describes what and how data will be collected 2. Describes how the data will be analyzed.	4
Expected Outcomes and Significance (1 mark per item) 1. States the expected outcomes. 2. Identifies the theoretical and practical significance of the research. 3. Convinces the reader of the importance of the research. 4. Speculates on implications of anticipated findings. 5. Provides future directions.	5
Presentation Skills (1 mark per item) 1. Uses eye contact effectively to engage the audience; speaks clearly, confidently with suitable volume & pace. 2. Uses smooth transitions to connect key points. **3.** Shows knowledge of the subject by responding confidently & accurately to questions.	3

CAPS 200 COURSE SCHEDULE (January-April 2019) T/TH 12:30-2:00 pm LSC 1.416

Week	Tuesday	Thursday
1 Jan 4 .2019	University Closed	Introduction to the Course The Power of Basic Sciences
2 Jan 8 & 10	How to Search for Scientific Literature **Kathy Hornby** **UBC Medical Liaison Librarian**	**Seminar 1: Dr. Haas** Problem Set 1 release
3 Jan 15 & 17	Deconstruction 1 Group Session on Journals 1-3	Deconstruction 2
4 Jan 22 & 24	Deconstruction 3	Deconstruction 4 **Problem Set 1 Due** Problem Set 2 release
5 Jan 29 & 31	Deconstruction 5	Deconstruction 6
6 Feb 5 & 7	Deconstruction 7	**Visit Dr. Haas Lab (TBA)** **Seminar Summary 1 Due**
7 Feb 12 & 14	**Q&A with Dr. Haas**	Tips on 10 min Presentation & Research Proposal (Dr. Osborne) **Problem Set 2 due**
Feb 19 & 21	**MIDTERM BREAK**	**MIDTERM BREAK**
8 Feb 26 & 28	**Seminar 2: Dr. Bamji** **Problem Set 3 release**	Deconstruction 1
9 March 5 & 7	Deconstruction 2	Deconstruction 3 **Problem Set 3 Due** Problem Set 4 release
10 March 12 & 14	Deconstruction 4	Deconstruction 5 **Seminar Summary 2 Due**
11 March 19 & 21	**Q&A with Dr. Bamji**	**Visit Dr. Bamji Lab (Jordan Shimell)** Course Survey
12 March 26 & 28	NO CLASS **Problem Set 4 Due**	NO CLASS
13 April 2 & 4	Student Presentations (Haas)	Student Presentations (Bamji)

Statement of Academic Integrity *The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.*