Anat-365A Cellular Trafficking, Fall Term 2023

Class time and location:
Mon/Wed/Friday 8:30-9:30AM, SADB 1/12

Overview of ANAT365 and Syllabus

During the first half of this course, called "The Basics", we will explore the fundamental mechanisms that govern the organization of intracellular membranes, how vesicle generation is signaled, how the membranes curve and bud, and how vesicles know where to go and fuse. In addition to intracellular vesicles, you will learn the principles of mitochondrial dynamics and process of cellular autophagy. In the second half of the course called "Applied Cell Biology", you will see how the exquisite regulation of cellular transport plays a central role in complex biological systems. A series of modules will take you through the mechanisms of cellular polarity, neurotransmission, metabolic cell biology, pathogen invasion, and more. In all cases, we will emphasize the morphological aspects of the processes, and on the major techniques that led to discovery.

By the end of this course, students should have a clear understanding of the core principles that govern the processes of intracellular transport, and have learned the functional importance of these pathways in multiple model systems.

The lectures are divided into 11 Modules. The first two sessions in each module are one-hour Theory Lectures on the topic, and the third, Practical lecture takes you through an assigned published paper that provides the best evidence supporting the concepts described in the two Theory lectures. The objective of the Practical Lecture is to demonstrate how novel techniques have led to the advancement of the field.

Course Co-ordinator

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Lecturers

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Grading

Summary:
Midterm: 37%
Final: 37%
Essay: 20%
Commentary on Module 6: 6%
Total: 100%

Midterm and Final Exam:

Each of these exams covers 5 weeks of course material. For each week module there will be 3 multiple choice questions for lectures 1 and 2 (total 6 points), with one multiple choice (1 point) and one short answer question (3 points) for the third lecture of each module (the "paper lecture"). Therefore each of the 5 modules is worth 10 marks within the exam. The **Midterm will be held in two parts, during class October 16 and 18**. Supplemental midterm may be held for any who miss it for valid reasons, to be scheduled at a time that suits all students. The exam for the second half of the course will be held in the Final Exam period schedule to be released by the University. The mid-term and final are each worth 37% of the final grade.

Course Paper

Detailed instructions will be given in a separate document on MyCourses. Topics will be assigned from each module, listed on WebCT on **Friday, September 29**. The essay will be **due Monday November 27** by myCourses, and will be posted/available the week of December 11. Essay is worth 20% of the final grade.

"Module 6" (Practice and politics of science) short commentary

This is the module where we talk about how science works. Students are asked to write a commentary on any aspect of these lectures, 1-2 pages that is worth 6% of the final grade. Topic suggestions include "what do you see is the future for scientific publishing", or "what does open access really mean", or "what is the impact of scientific fraud".... it's up to you. It is encouraged to submit this commentary shortly after the module is complete so you don't forget what you learned, but it is not formally due until December 5.

Lecture Outline:

Overview

The Basics

1. The organization of intracellular membranes and organelles (Heidi McBride)
2. Signaling to enter (Heidi McBride)
3. Vesicle fusion (Wayne Sossin)
4. Mitochondria (Heidi McBride)
5. Autophagy and secreted vesicles (Heidi McBride)

*Midterm in 2 parts during class: **MONDAY October 16 and WEDNESDAY October 18**, covering Modules 1-5, The Basics.*

6. The practice and politics of biomedical research (Heidi McBride and friends)

Applied Cell Biology

7. G-Protein coupled receptors (Thomas Stroh)
8. The cell biology of metabolism (Jennifer Estall)
9. Cell polarity and regulated secretion (Wayne Sossin)
10. Invasion by pathogens (Natalie Zeytuni)
11. Myelination (Tim Kennedy)

***Final exam: In the final exam period**, covering Modules 6-10, Applied Cell Biology.*

Reference texts for the lectures.

Molecular Biology of the Cell: Eds. Bruce Alberts et al., 5th edition.

Available online at PubMed bookshelf (http://www.ncbi.nlm.nih.gov/books/NBK21054/)

On reserve in Montreal Neurological Institute Library, http://mnihlb.wordpress.com/

Particularly read:

Chapter 12: Intracellular compartments and protein sorting

Chapter 13: Intracellular Vesicular Transport

And Methods Sections:
Chapter 8: Manipulating Proteins, DNA and RNA
Chapter 9: Visualizing Cells

Detailed Module Descriptions

THE BASICS

Module 1: The organization of intracellular membranes and organelles (Heidi McBride)

Wednesday August 30: Lipids in membranes and organelles.

Friday Sept 1: Specificity of transport routes.

Wednesday Sept 6: Paper lecture

Module 2: Signaling to enter (Heidi McBride)

Friday Sept 8: Triggering entry through ubiquitination.

Monday Sept 11: Signaling along the way.

Wednesday Sept 13: Paper Lecture

Module 3: Autophagy and secreted vesicles (Heidi McBride)

Friday Sept 15: Exosomes, ecotosomes and intracellular signaling

Monday Sept 18: Autophagy

Wednesday Sept 20: Practical paper lecture.

Module 4: Mitochondria (Heidi McBride)

Friday Sept 22: Mitochondrial dynamics

Monday Sept 25: Mitochondrial derived vesicle transport

Wednesday Sept 27: Practical paper lecture

Module 5: Membrane fusion (Wayne Sossin)

Friday Sept 29: Fusion 1

Monday Oct 2*:* Fusion 2

Wednesday Oct 4: Practical paper Lecture

Friday Oct 6 – Wed Oct 11: Fall break McGill

FRIDAY October 13 – study day/REVIEW

MONDAY OCTOBER 16: MIDTERM IN CLASS – PART 1
WEDNESDAY OCTOBER 18: MIDTERM IN CLASS – PART 2

Module 6: The practice and politics of biomedical research (Heidi McBride)

Friday October 20: The Ethos and Pathos of Science (Ivan Topisirovic)

Monday October 23: The realities of research; funding, metrics and failures (HM)

Wednesday October 25: Surprise lecture

***NOTE: module 6 will not be included in formal exams, but students must write a 1-2 page essay on a topic related to this module worth 6% of the final grade. Due by December 5.**

APPLIED CELL BIOLOGY

Module 7: Regulation of receptor transport –G coupled receptors (Thomas Stroh)

Friday Oct 27: Regulated G-protein trafficking 1

Monday Oct 30: Regulated G-protein trafficking 2

Wednesday Nov 1: Practical paper lecture.

Module 8: Cell Biology of Metabolism (Jennifer Estall)

Friday Nov 3: Metabolism 1

Monday Nov 6: Metabolism 2

Wednesday Nov 8: Practical paper lecture

Module 9: Cell polarity and regulated secretion (Wayne Sossin)

Friday Nov 10: Specialized protein sorting – apical vs basolateral

Monday Nov 13: Specialized protein sorting: secretory granules

Wednesday Nov 15: Practical paper lecture.

Module 10: Vesicle transport in immunity (Natalie Zeytuni)

Friday Nov 17: Bacterial infection

Monday Nov 20: Viral infection

Wednesday Nov 22: Practical paper lecture.

Module 11: Myelination (Tim Kennedy)

Friday Nov 24: Myelination 1

Monday Nov 27: Myelination 2

Wednesday Nov 29: Practical paper lecture.

_____ END OF LECTURES

Friday December 1: REVIEW SESSION

Final exam schedule will be posted by the University

Two policy statements required by the University:

Language of Submission

"In accord with McGill University's Charter of Student Rights, students in this course have the right to submit in English or in French any written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives." (Approved by Senate on 21 January 2009)

« Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté, sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue. »

Academic Integrity

"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures." (Approved by Senate on 29 January 2003) (See McGill's guide to academic honesty for more information.)

« L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le guide pour l'honnêteté académique de McGill.»

Departmental Grading Policy

The Department of Anatomy & Cell Biology will **NOT** revise/upgrade marks except on sound academic grounds. Once computed, the marks in this course will **NOT** be altered/increased arbitrarily. Decimal points will be "rounded off" as follows: if the final aggregate mark is computed to be 79.5%, the mark will be reported as 80% (an A-); a final aggregate mark of 79.4% will be reported as 79% (a B+). These marks are **FINAL and non-negotiable.**

Departmental Midterm Exam/In-Course Assessment Deferral Policy

A midterm exam or other in-course assessment (i.e. quiz, assignment, paper, etc.) in a course administered by the Department of Anatomy & Cell Biology may only be deferred in the case of a **justified absence** due to serious illness or significant extenuating circumstances AND when **valid documentation** is received by the Course Coordinator within FIVE working days of the original midterm exam or due date.

If the deferral request is accepted by the Course Coordinator, students may be offered one or both of the accommodations below, depending on the grading structure of the course:

a) Add the weight of the midterm exam/in-course assessment to the final exam or another course component

b) Write a deferred midterm exam/submit a deferred assessment which will be scheduled/due within 10 days of the original midterm exam/due date

For ANAT365 we have a two-part Mid-Term happening during class hours on 2 days. For any who miss the exam for VALID REASONS we will identify a time that suits the students requiring the deferral to write a supplemental midterm worth the same as in the established grading scheme.

Please see the full policy, including information on valid documentation requirements, here: www.mcgill.ca/anatomy/undergraduate/policies-resources.

University Policy on Reassessments and Rereads

Please see the eCalendar for policies regarding reassessments of coursework and rereads of final exams:
www.mcgill.ca/study/university_regulations_and_resources/undergraduate/gi_final_examinations.
