Biology 4DD3 - Molecular Evolution
Biology Department, McMaster University – Winter Term, 2015

Revised: 9 September 2015

Instructor:
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Course Description
This course will explore how molecules change over time within and between species. We will examine principles of molecular evolution and their application to conservation biology, evolutionary ecology, forensic biology, phylogenetics, systematics, and behavioural ecology.

The course begins with studies of patterns of mutations versus substitutions and how these two can differ. Studies of synonymous and nonsynonymous changes show that these two also differ. Theories of the processes causing molecular change are considered, such as the neutral theory of molecular evolution. Some special cases such as pseudo genes, multigene families, selfish DNA and transposons are considered. Some basic questions are asked such as: Can molecules tell time? Is one codon better than another? How does one measure genetic distance? Where do new genes come from? Are gene duplicates really redundant and if so, why do they persist? How are genomes organized?

A part of the course will be devoted to “case studies” of individual examples of molecular change and how they have been used to study the origin of life, to study the origin of mitochondria, to study HIV viral evolution, to study the evolution of sex determination, to study the historical movements of early humans.

Prerequisite: Anthro 2D03 or Biology 3FF3

Lectures: Lectures: 8:30-9:20, MDCL 1116, Tuesday and Friday

Tutorials: 11:30-12:20, GS101 Thursdays

Textbook: None; peer reviewed publications will be used

Evaluation:
The two mid-term exams will test concepts from the first and second thirds of the course respectively. The final focus in part on the final third but also the rest of the course and therefore WILL be cumulative.

Problem sets will be due electronically before the tutorial each week. Please email the problem sets to the TA. No late problem sets will be accepted. The problem set portion of your grade will be based on the best 8 problem sets that you hand in out of a total of 9 or 10 problem sets that will be assigned. In the tutorials students will discuss answers to the problem sets that were due that day with the guidance of the teaching assistant. Student groups will be required to present that paper(s), lead discussions including relevant background information, and ask questions in tutorials.

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<td>Mid-term 1 (fifty minutes)</td>
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<td>Problem sets</td>
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<td>Tutorial Presentation, Questions,</td>
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<td>Final Exam (2 hours)</td>
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Changes To This Outline

The instructor reserves the right to change the means by which our course objectives are to be achieved, but this will not occur either precipitously or without reasonable notice to the students enrolled in the course. Such changes could result, for example, from new ideas emerging as the course develops and/or from particular arrangements discussed between instructor and students.

Policy Reminders

We refer all students to the McMaster University Senate Policies for the standards of honesty expected for this course, including:

- Senate Resolutions on Academic Dishonesty
- Statement of Academic Ethics
- Absence/Missed Academic Work Policy

We follow the McMaster University Senate Policies on Absence/Missed Academic Work. To avoid penalty, students who miss a published due date for any assignment or any examination are required to provide acceptable documentation to their Dean of Studies as to why the assignment or exam was missed. Once such documentation has been provided, the University will inform the Instructor. The Instructor and the student then can reach an agreement as to how to handle any required revision to grading. An exam or assignment completely missed without reason will be recorded as a grade of 0%. Late assignments will be penalized. In most cases we cannot offer makeup exams.

(Please visit the URI http://www.mcmaster.ca/academicintegrity for details about the academic integrity policy for Mc- Master University. Also note only McMaster approved standard calculators are permitted in tests or exams).