

Biology 4DD3 - Molecular Evolution - Not offered in 2009-2010

Spring 2009

Instructors: Brian Golding, Ben Evans, Jonathan Stone

Course Description

The study of how molecules change over time within and between species. The experimental data, techniques and theories will be examined.

This course examines the basic molecular mechanisms by which species change over time. The principles and practices that will be covered can be applied to study conservation biology, evolutionary ecology, forensic biology, phylogenetics, systematics, behavioural ecology, pharmacology,...

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 transposon's are considered. Some basic questions are asked such as: Can molecules tell time!? Is one codon better than an other? 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, and so on.

Prerequisite: Anthro 2D03 or Biology 3FF3

Lectures: Monday/Tuesday/Thursday 9:30/10:30/9:30 **Location BSB 106**

Tutorial: Monday/Tuesday 10:30/12:30 **Location TBA**

The tutorial will be a mixture of topics. In general papers will be assigned every other week for discussion. In turn, student groups will be required to present that paper(s) and then to lead

a discussion of that paper(s) including relevant background. On other weeks problem sets / exercises will be assigned.

Each student prepare a written report on some topic dealing with molecular evolution. The topic will be your choice but must be cleared through one of the instructors first and must deal with some aspect of molecular evolution. A one page project proposal (worth 2%) is due the last class day before reading week. The final report should be no more than 20 pages double spaced (including figures, tables, references) and will not be returned (so make an extra copy for yourself). The term paper is due on or before 5:00pm Tuesday April 7. Note this date — many other things are due just before classes end, it would be best to hand it in a week before hand!. Late essays will be penalized 5 marks per day (5:00pm to 5:00pm).

Textbook: Fundamentals of Molecular Evolution by W.-H. Li & D.Graur.

Evaluation:

Mid-term (fifty minutes; Feb 23)	20%
Tutorial Participation / Problems	20%
Term Project - Written Report	20%
Final Exam	40%

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