

Course Outline

BIOL361 Molecular Genetics and Genomics, Summer 2015

Instructor: Dr. Jürgen Ehling

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Lectures: CLE Rm. A212. 10:30 AM– 12:20 PM Monday Wednesday, and Thursday

Office hours: by appointment, please inquire by eMail

Course Description:

Naturally occurring and induced genetic mutations leading to phenotypic variation within- and among-species in a diversity of eukaryotic taxa, including yeasts, plants and vertebrates. Regulation of transcription and translation (including small regulatory RNAs), protein-protein interactions, molecular mechanism of tumor formation, genome structure and mobile genetic elements, and functional genomics.

Evaluation

One hundred (100) marks in total: Two midterm exams, each worth 30 marks and a final exam (cumulative, with focus on material after the second midterm) worth 40 marks.

Grading scheme: A+ (90%-100%), A (85-89.75%), A- (80-84.75%), B+ (77-79.75), B (73-76.75%), B- (70-72.75%), C+ (65-69.75%), C (60-64.75%), D (50-59.75%), F (<50%)

Notes

There will be deferred midterm exams scheduled outside lecture time within a week after the midterm for those providing proper documentation (eg doctors note). If you also miss the deferred midterm but provide a doctor's note, your final mark will be calculated on the basis of the other completed components of the course, and you will not incur any penalty. I will assign a zero (not an incomplete) for an unexcused missed midterm or assignment.

Only pen and pencil will be permitted during any exam; no texts, no electronic devices. Students must abide by academic regulations as set out in the university calendar. They must observe standards of scholarly integrity with regards to plagiarism and cheating. Please refer to UVic Academic Calendar webpage below:

<http://web.uvic.ca/calendar2008/FACS/UnIn/UARe/PoAcI.html>

Resources

Lecture notes and complete references of key papers will be uploaded to Moodle. *Molecular Biology of the Cell* (the textbook for BIOL360) will be very useful but is not required.

Lecture schedule

A Phenotype to Genotype

- Monday, May 14: Course introduction
Qualitative and quantitative genetic loci: Sticklebacks with a no-pelvis phenotypes
- Wednesday, May 16: Mapping Pitx1: the transcription factor responsible for pelvis phenotypic variation.
- Thursday, May 17: Molecular basis of convergent evolution of hind-limb reduction in animals.
- Monday, May 21: *Victoria Day – University closed*
- Wednesday, May 23: Whole genome association genetics and human diseases: Clubfoot disease and anemia, BCL11 and fetal hemoglobin (HbF)
- Thursday, May 24: Whole genome sequencing approaches and eukaryotic genome structure

B Genome Structure and Plasticity

- Monday, May 28: Transposable elements and their mode of jumping
- Wednesday, May 30: ***MIDTERM 1 (30/100)***
- Thursday, May 31: Transposable elements shape genomes and facilitate evolution.
- Monday, June 4: Gene and genome duplications.

C) Molecular Basis of Tumor Formation in Mammals and Plants

- Wednesday, June 6: Mammalian tumors and their cause: alterations of cancer critical genes
- Thursday, June 7: Genomics of mammalian tumor formation.
- Monday, June 11: Introduction to plant tumors and their cause; the tumor inducing plasmid of *Agrobacterium tumefaciens*.
- Wednesday, June 13: Molecular mechanism of plant tumor formation.
- Thursday, June 14: ***MIDTERM 2 (30/100)***
- Monday, June 18: Inter-kingdom lateral gene transfer and its use to create genetically modified plants

D) The diverse functions of non-protein-coding RNAs

- Wednesday, June 20: The diverse functions of RNA's during transcription and translation.
- Thursday, June 21: The discovery of small regulatory RNA's in *Caenorhabditis elegans*.
Post-transcriptional regulation of gene expression via small interfering RNAs: Mechanisms of small RNA regulatory action.
- Monday, June 25: Bacterial immunity against viruses involving the CRISPR/Cas systems and its use in genome editing.

Wednesday, June 27: Gene regulatory mechanisms involving long non-coding RNA's:
HOTAIR.

Thursday, June 28: **Final Exam**

**UVic is committed to promoting, providing and protecting a supportive and safe learning
and working environment for all of its members.**