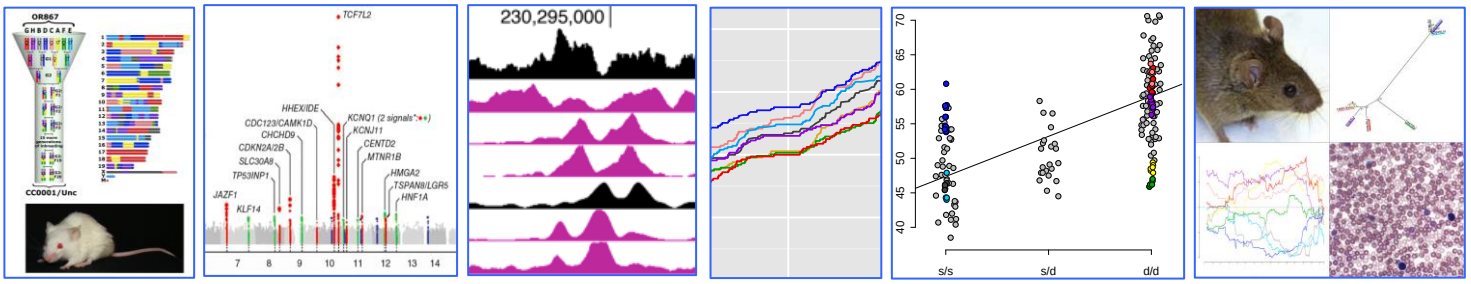

BIOL/GNET 646: Mouse Models of Human Disease (1 credit)-recently updated

January 9 – February 11, 2019 Instructors: Scott Bultman & Folami Ideraabdullah

This is an advanced lecture-styled module for students seeking in depth understanding of how to harness the power of genetic mouse models to study human phenotypes. We focus on the laboratory mouse as a model organism to learn fundamental genetic concepts while discussing how mouse models combined with state-of-the-art experimental approaches are used to elucidate gene function relevant to human development, physiology, and disease. There will be an emphasis on understanding how genetic, physiological, environmental, and microbial differences influence mouse model development for human disease. Lectures will cover approaches for manipulating the mouse genome and for utilizing naturally occurring genetic variation among mouse strains to identify and characterize causal genes. The latter portion of the class will cover use of mouse models for studying the epigenetic basis of disease. A common theme of the course is to understand optimal approaches for using technology and resources (consortiums & databases) to develop and analyze mouse models for translational studies in pre-clinical settings.

Topics to be covered include:

- The laboratory mouse as a model for mammalian genetics
- Knockouts, knock-ins, and conditional knockouts
- Genetic Reference Populations: eg. Collaborative Cross
- Modeling epigenetic mechanisms of disease

BIOL/GNET 647: Human Genetics and Genomics (1 credit)

February 13 – March 24, 2019 Instructors: Karen Mohlke & Samir Kelada

This module will focus on the principles and modern approaches of human genetics and genomics. Analysis of human genetic variation is used to understand the fundamental concepts of genetics. This module covers current research methods for analysis of genome regulatory elements, focusing on the genetic architecture of complex human traits and diseases. The molecular basis of genetic disorders and the identification of specific disease variants will be used to illustrate key points. In a weekly recitation, students will discuss assigned readings and problem sets with the Teaching Assistant.

Topics to be covered include:

- Human genetic variation in individuals and populations
- Genome-wide association analyses
- Exome and genome sequencing in monogenic and complex human traits
- The Haplotype Map, 1000 Genomes, ENCODE and RoadMap Epigenomics Projects
- The molecular basis of human complex traits and diseases
- Current medical genetics and genomics

BIOL/GNET 645: Quantitative Genetics of Complex Traits (1 credit)

March 26 – April 24, 2019 Instructor: Martin Ferris

Students will learn about various topics that form the basis for understanding Quantitative Genetics of Complex Traits with biomedical, agricultural and evolutionary relevance. The ultimate goal of quantitative genetics in this post-genomic era is prediction of phenotype from genotype, namely deducing the molecular and physiological bases for genetic trait variation.

Topics to be covered include:

- Basic principles of population and quantitative genetics
- Selection theory and applications in research, agriculture and evolution
- Partitioning of Genetic Variance: additive, dominance, epistasis, heritability, correlations
- QTL Detection: linkage, association, mouse models, other animal/plant models, GWAS
- Advanced Partitioning of Quantitative Genetic Variance: Networks, Systems Genetics, Causal Inference
- Applications of Quantitative Genetics: whole genome selection, risk prediction, breeding values

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All courses include two lectures per week (Tuesdays and Thursdays, 12:30-1:45 PM TBD); material covered in lectures is reinforced through readings of research and review articles. Recitations meet Fridays 1:30-2:30PM TBD.
A previous course in genetics is helpful, but is not absolutely required.