GNET 645: Quantitative Genetics of Complex Traits (1 Credit)

Syllabus – Spring Semester, 2013

- January 10 - February 12, 2013
- Tuesdays and Thursdays from 12:30 to 1:45 PM
- 2303 McGavran-Greenberg
- Instructor: Daniel Pomp (dpomp@unc.edu; 919-966-0013)
- Office Hours: Wednesdays from 2 to 3 PM

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

Date	Topic	Optional Readings
Jan 10	Introduction to course; Why quantitative genetics is important; The nature of quantitative genetic variation	*Falconer Introduction *Lynch and Walsh 1
Jan 15	Basic Concepts in Quantitative Genetics I: Forces that change allele frequency at a single locus: Selection, Mutation, Migration, Drift; Hardy Weinberg Equilibrium	*Falconer Chapters 1-4 *Lynch and Walsh 4
Jan 17	Basic Concepts in Quantitative Genetics II: Genetic variance: additive, dominance, epistasis; Heritability Estimation	*Falconer Chapters 6-8, 10 *Lynch and Walsh 5-6
Jan 22	Basic Concepts in Quantitative Genetics III: Coancestry and relationship in pedigrees; Genetic correlation; GXE interaction	*Falconer Chapters 5, 9, 14-16 *Lynch and Walsh 7, 10
Jan 24	Selection I: Theory; Natural selection versus Artificial selection; Selection Limits	*Falconer Chapters 11-13 Will be distributed
Jan 29	Selection II: Applications and Uses: Research; Breeding; Evolution	*Falconer Chapters 11-13
Jan 31	Selection III: Signatures of selection; Whole-genome selection in agriculture; Risk factor estimation in humans.	Will be distributed
Feb 5	QTL detection I: Mouse models; Linkage Analysis and Next-Generation resources	*Falconer Chapter 14-15 *Lynch and Walsh 12-16
Feb 7	QTL Detection II: Human GWAS	Will be distributed
Feb 12	Advanced partitioning of quantitative variance: eQTL, mQTL, pQTL, vQTL, Networks, Systems genetics	Will be distributed

Various readings and preparatory materials will be distributed in class.

*Optional Textbooks for In-Depth Understanding:
1) Falconer, D. S., and T. F. C. Mackay, 1996 *Introduction to Quantitative Genetics*, Ed 4. Longmans Green, Harlow, Essex, UK. 2) Michael Lynch and Bruce Walsh, 1998 *Genetics and Analysis of Quantitative Traits*, By Sinauer Associates, Inc., Sunderland, MA.

There will be a Final take-home exam at the end of the course; it will be distributed on Tuesday, February 12 and is due on Tuesday, February 19. Grading in the class will be determined by class participation (50%; based on various assignments and readings, in-class discussions) and the final exam (50%).