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Lecturer: Wendi Neckameyer, Ph.D.
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Teaching Goals: At the end of this section, you should understand basic genetics terminology, be able to identify phenotypes arising from one- and two-gene crosses, understand the basics of molecular tools applied to genetics studies, and understand how multiple genes interact to yield a phenotype, understand how a DNA replication fork works, appreciate the importance of DNA repair mechanisms, diagram a molecular recombination event, and understand how DNA metabolism underlies classical genetics.

Focal points will be Mendelian genetics, genetics as a quantitative science, genetic analysis techniques, the DNA replication fork, and the Holliday junction.

It is expected that the required reading will be completed prior to the indicated lecture. Homework will be assigned in many lectures. It is expected that the assignments will be completed in time to be discussed in the next scheduled lecture.

Sept. 18 Mendelian analysis Neckameyer
Topics: Dominance, allele combinations, lethality, epistasis, suppressors, penetrance, and genetic crosses.
Required reading: Handouts; supplemental material in Griffiths Chapter Two.

Sept. 19 Sex Chromosome and Linkage Neckameyer
Topics: Meiosis and sex linkage.
Required reading: Handouts and Griffiths Chapter Three.

Sept. 20 Quantitative Trait Loci and Single Nucleotide Polymorphisms Neckameyer
Topics: Genetic basis of complex traits, genetic dissection of complex traits, single nucleotide polymorphisms.
Required reading: Handouts and Griffiths pp. 484-486; 838-842.
Sept. 21 Mutations, and Summary of Mendelian Genetics Neckameyer
Topics: Review of Mendelian genetics, focusing on mutations and how they affect genetic expression.
Required reading: Handouts; supplemental material in Griffiths Chapter Seven.

Sept. 24 Molecular Approaches I: Nucleic Acids Neckameyer
Topics: Restriction enzymes, subcloning, DNA sequencing, PCR, electrophoresis, Southern transfer.
Required reading: Handouts and Alberts Chap 8 (you can skim sections not related to the molecular techniques in the handout, but they won’t be covered).

Sept. 25 Molecular Approaches II: Proteins Neckameyer
Topics: Protein electrophoresis, western blotting, antibody generation, immunohistochemistry.
Required reading: Handouts; Nat. Gen. Suppl. 33:276-284 (2003); Alberts Chap 9 (you can skim sections not related to the molecular techniques in the handouts, but they won’t be covered).

Sept. 26 Restriction Length Polymorphisms and Microarrays Neckameyer
Topics: RFLPs, their use as genetic markers, human disease examples, and microarrays.
Required reading: Handouts; supplemental material in Griffiths Chapter Seventeen.

Sept. 27 Genetic and Transgenic Systems Neckameyer
Topics: Utility of roundworms, fruit flies, zebra fish, and mice as model organisms, transgenic technology in these model systems.
Required reading: Handouts; supplemental material in Griffiths Chapter Fifteen.

Sept. 28 DNA Replication I Tavis
Topics: Biological and biochemical constraints on DNA replication, overview of replication, initiation of DNA replication, enzymes of replication, the replication fork.

Sept. 28 DNA Replication II Tavis
Topics: The replication fork in detail, termination and resolution, special problems for eukaryotic replication, other modes of replication, fidelity of replication.
Required reading: Alberts pp. 251-266.
NOTE: Lecture will be from 10.00-11.00.

Oct. 1 DNA Repair I Tavis
Topics: Biological necessity for DNA repair, DNA damage, repair pathways overview, photoreactivation.

Oct. 2 DNA Repair II Tavis
Topics: Base excision repair, nucleotide excision repair, SOS repair, recombinational repair.
Oct. 3      DNA Recombination I      Tavis
Topics: Biological necessity for DNA recombination, homologous recombination overview, synopsis, the Holliday junction.

Oct. 4      DNA Recombination II     Tavis
Topics: Outcomes of a Holliday junction, gene conversion, recombination over double-stranded gaps, non-homologous recombination, integration, and transposition.

Oct. 5      Section II Review      Tavis & Neckameyer
Question/answer review period to assist studying—attendance is optional.
NOTE: Review meets from 9.00-11.00

Oct. 8      Exam
9:00 am to noon in LRC 105 A & B and 106 A & B

Textbooks and Journal Articles:

The Alberts text is hard-copy on reserve in the library and is accessible through the “Bookshelf” on PubMed. The chapters in Griffiths and the articles assigned by Dr. Neckameyer will be handed out as hard-copies. The articles assigned by Dr. Tavis will be on electronic reserve in the library (Password: BBSG501).
