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Teaching Goals: To provide students with a basic understanding of the biochemical mechanisms by which DNA is maintained in cells, how mutations and recombination lead to genetic diversity, how DNA metabolism underlies genetics, Mendelian genetics, genetic linkage, meiosis and mitosis, recombinant DNA technology, and epistasis.

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

Sept. 13 DNA Replication I Tavis
Topics: Necessity of DNA replication, biological and biochemical constraints on DNA replication, overview of replication, initiation of DNA replication, enzymes of replication, the replication fork.

Sept. 14 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.
Sept. 15      DNA Repair I     Tavis
Topics: Biological necessity for DNA repair, DNA damage, repair pathways overview, photoreactivation.

Sept. 16      DNA Repair II    Tavis
Topics: Base excision repair, nucleotide excision repair, SOS repair, recombinational repair.

Sept. 17      DNA Recombination I     Tavis
Topics: Biological necessity for DNA recombination, homologous recombination overview, synapsis, the Holliday junction.

Sept. 20      DNA Recombination II    Tavis
PLEASE NOTE: Class will be held in LRC 108 A and B
Topics: The Holliday junction, outcomes of a Holliday junction, gene conversion, recombination over double-stranded gaps, non-homologous recombination, integration, and transposition.

Sept. 21      From the Double Helix to Mendel     Tavis
Topics: How DNA recombination and segregation lead to basic Mendelian genetics.
Required reading: Alberts 1127-1133; Griffiths pp. 21-27.

Sept. 22      Mendelian analysis     Zassenhaus
Topics: Gene segregation, gametes, independent assortment, pedigrees.
Required reading: Griffiths Chapter 2

Sept. 23      Chromosome Theory of Inheritance     Zassenhaus
Topics: Meiosis, mitosis, sex linkage, fungal genetics.
Required reading: Griffiths Chapter 3

Sept. 24      Extensions of Mendelian Analysis     Zassenhaus
Topics: Allele phenotypes, multiple alleles, multigene inheritance, penetrance and expressivity.
Required reading: Griffiths Chapter 4

Sept. 27      Linkage I: Eukaryotic Chromosome Mapping     Zassenhaus
Topics: Linkage and recombination, linkage maps, using chi square, crossing over.
Required reading: Griffiths Chapter 5

Sept. 28      Linkage II: More Fun with Chromosome Mapping    Zassenhaus
Topics: Linkage maps, Poisson distribution, tetrad analysis, mitotic segregation.
Required reading: Griffiths Chapter 6
Sept. 29  Recombinant DNA Technology  Neckameyer
Topics: Restriction enzymes, subcloning, DNA sequencing, PCR, Southern transfer
Required reading: Griffiths Chapter 14

Sept. 30  Applications of Recombinant DNA Technology  Neckameyer
Topics: Model systems, transgenics, screening for genetic diseases
Required reading: Nat. Gen. Suppl. 33:276-284 (2003); Griffiths Chapter 15 (pp. 466-486 only).

Oct. 1  Applications of Classical and Molecular Genetics I  Eissenberg
Topics: Nondisjunction in Down’s Syndrome

Oct. 4 Applications of Classical and Molecular Genetics II  Eissenberg
Topics: Genetic pathways in epistasis

Oct. 5  Section II Review  Zassenhaus, Neckameyer, Eissenberg
PLEASE NOTE: Class will be held in LRC 108A & B
Question/answer review period to assist studying—attendance is optional.

Oct. 6  Exam
9:00 am to noon in LRC 105 A & B and 106 A & B

Textbooks and Journal Articles:

Copies of all required reading material will be provided. The Alberts text is hard-copy on reserve in the library, copies will be provided of the chapters in Griffiths, and the articles are on electronic reserve in the library (Password: BBG501).


Griffiths, Miller, Suzuki, Lewgontin, and Gelbart. An introduction to genetic analysis, 6th edition. NOTE: relevant chapters will be photocopied and provided.