Week 5

- Terms
  - Eukaryotic cell has a nucleus
  - Chromosomes are long strands of DNA and associated Proteins
  - A gene is a portion of DNA that codes for protein
  - Each gene can have several alleles or alternative forms
- 1600's
  - a pre made human was contained in every sperm cell
- many thought that an offspring's traits were blended from each parent
  - mother – purple flowers
  - father – white flowers
  - offspring – light purple flowers
- Law of Inheritance
  - Mendel used the garden pea plant to study how traits were inherited
    - Easy to grow
    - Quick reproduction
    - Cross-pollinated by hand
      - This allows the scientist control over the crossing (mating) of the plant
    - Had easily observable traits
  - First Mendel examined traits that have two expressions (like short and tall)
  - Short and short always produced short offspring
  - When tall plants were crossed the results were variable
    - Sometimes tall plants
    - Sometimes short plants
    - Sometimes short plants disappeared, but then reappeared in future generations
  - The tall trait seemed to obscure the short trait
  - The tall trait was dominant to the short trait
    - The allele for tall was dominant
    - The allele for short was recessive
      - Gene is plant height allele is short or tall
    - Dominant allele represented by capital letter
      - "T"
    - Recessive allele represented by lowercase letter
      - "t"
    - Some genes can have hundreds of alleles
- Law of Segregation (look at 5-15)
  - During meiosis only one copy of each gene is placed in each gamete
  - A diploid cell can only have two alleles/gene
  - If those 2 alleles are the same, the individual is homozygous (TT or tt)
  - If those 2 alleles are different, the individual is heterozygous (Tt)
- Laws of Inheritance

- Genotypes express the genetic makeup of an individual
  - Homozygous dominant (TT)
  - Homozygous recessive (tt)
  - Heterozygous (Tt)
- Phenotypes are the outward expression of the individual
  - The outward expression of the gene
  - Tall or short
- Mendel developed a system to keep track of all his crosses (matings)
  - –Parental generation: P generation
  - –P's offspring: F_1 generation
  - –F_1's offspring: F_2 generation
  - –And so on….

- Law of Inheritance
  - Started with a P generation that was TT or tt
  - Crossed TT with tt, F_1 generation was all tall
  - Next, he took plants from the F_1 generation and set up a monohybrid cross
    - Mating between 2 individuals that are heterozygous for one trait (gene)
    - F_2 for every 3 tall plants, there was 1 short plant
    - Phenotypic ratio: 3 tall:1 short
  - Punnett square uses the genotypes of the parents to reveal which alleles the offspring might inherit
    - All three possible genotypes are possible in the F_2 generation (Genotypic ratio = 1 TT:2 Tt:1 tt)
  - In a monohybrid cross, both parents are heterozygous (Tt) for height
- Exceptions to Mendel's Laws
  - There are some situations in which phenotypic ratios do not conform to Mendel's prediction
  - Example: Incomplete Dominance occurs when a heterozygote has an intermediate phenotype between the 2 homozygotes
  - Homozygous red flower crossed with a homozygous white flower results in all pink flowers
  - 2 pink flowers crossed results in 1 white, 1 red, and 2 pink
- Incomplete Dominance
  - Red and white flowers return in the F_2 generation
  - The single copy of the R allele in the heterzygote codes for less pigment production than 2 copies of the R allele do
- Polygenic Traits
  - Polygenic traits depend on more than one gene
    - Most inherited traits are polygenic
    - The phenotype reflects the activity
    - Ex: eye color is encoded by multiple genes
- Sex-linked Traits
  - Males are XY

    - Females are XX
    - Sex-linked traits are carried on the X chromosome
    - To be color blind a male must inherit it from his mom parent, but a woman needs to inherit from both parents
        - Patterns of inheritance differ for men and women
    - Male must inherit normal color vision from his mother, but a female can inherit from either parent
- Environmental Effects
    - Skin color is a polygenic trait that is influenced by the environment

Week 6

- Viewpoint before Darwin
    - The earth was young (6,000 years old)
    - Each species was created at the same time and doesn't change or die out
    - The number of species never changes
    - Advances in science led to awareness of change in lines of descent of species
    - 18th and 19th century naturalists tried to reconcile traditional beliefs with evidence of change
- Evolution
    - The genetic change in a population over time
        - Genetic change is a change in allele frequency
        - Population – group of individuals of the same species that are interacting (same place, same time)
    - Darwin's observations on a voyage around the world in 1831 led to new ideas about species
        - Resemblance of extinct and living species
            - Modern armadillo vs. extinct glyptdont
            - Variations in traits influence an individual's ability to secure resources
                - Influence survival and reproduction
- Darwin, Wallace, and Natural Selection
    - 1858: Wallace sent Darwin his ideas on evolution by natural selection
    - Both presented at a conference
    - Darwin published On the Origin of Species in 1859 (sold out on the first day)
- Theory of Natural Selection
    - Natural selection
        - Different survival and reproduction among individuals of a population whose traits vary
        - Mechanism of evolution
        - Heritable traits that allow for greater reproductive success become more common in a population over time
        - Fitness is a measure of relative reproductive success