

# Genes and Inheritance

- Eukaryotic cells have chromosomes (a single molecule of condensed DNA)
- Portions of the DNA that code for protein are called genes
- A gene is a sequence of DNA that is eventually going to code for proteins
  - Each gene has different variants, called alleles
    - Alleles code for the same trait, but the sequence of bases are different
- History of Genetics and Inheritance
  - 1600s said a pre-made person was inside of every sperm cell
  - Many thought an offspring's traits were combined from each parent
    - Purple flowers and white flowers combine to make light purple flowers
  - Mendel and the Laws of Inheritance
    - Monk living in the present day Czech Republic in the early 1800s
    - Experimented on pea plants
      - Quick generation time, easy to fertilize and grow, and produce many offspring
      - Chose easily observable traits in pea plants
        - Height and flower color
        - When he crossed two short plants, the offspring were always short
        - When he crossed two tall plants, the offspring were variable
        - Crossed the offspring together
          - Sometimes short individuals would disappear for a generation and then come back
          - Inferred the tall trait was somehow obscuring the short trait
          - Tall trait is dominant and short trait is recessive
        - Observed the same thing with flower color
      - When an individual carries a dominant allele on one chromosome and the recessive allele on the other chromosome, the dominant masks the recessive
        - Dominant alleles get uppercase letter and recessive allele gets a lowercase letter
      - Changed the way inheritance was viewed
    - Law of Segregation
      - Diploid parents put one of two copies of each trait (one allele) into each gamete
- Laws of Inheritance
  - In diploid cells, you have two copies of each gene (homologous chromosomes)
  - If you have the same two alleles, you are homozygous for that gene
  - If you have two different alleles, you are heterozygous for that gene
    - Heterozygous individuals will show the dominant trait
  - Genotypes are the genetic makeup of an individual (AA, Aa, aa)
  - Phenotypes are the outward appearance of a trait
- Mendel developed a system to keep track of all of his crosses
  - Parental generations is P