DNA

- Molecular genetics
  - Molecular basis of inheritance
  - Genes -> enzyme -> metabolism
  - DNA –transcription-> RNA –translation> Protein
  - Era of Ome's
    - Genome: study of genes of organisms
    - Proteomics: study of proteins
    - Transcriptomics: Study of RNA/mRNA
    - Metabolomics: study of metabolites
    - Structural genomics: study of protein structure
    - Bioinformatics: information technology to molecular genetics
    - Pharmacogenomics: Drug responses
  - In bacterial cell there is only mRNA
  - In eukaryotic cell there is pre-MRNA

- What is a gene
  - Gene is basic unit of heredity in a living organism responsible for a morphological trait
  - Gene is a segment of DNA that specifies a morphological trait
  - Piece of deoxyribose nucleic acid directing synthesis of a protein

    - Linear nucleotides creating a polynucleotide
    - Pyrimidines: CUT, cytosine, uracil, thymine
    - Purines: Adenine and guanine
    - DNA is pentose sugar, nitrogenous base, linked by phosphate group and phosphodiester bond

- Information Processing
    - Nucleotides = letters (CATG)
    - Word = CODON = comprised of 3 “letters” nucletides = unit of genetic information
    - 1 Codon = 1 amino acid (definition)
    - 500,000,000 codons aka 500,000,000 amino acids
    - 490 copies of bio textbook
    - 3 bases a second = 47.6 years to read
    - Chimp and human DNA differ by 0.5% or 15,000,000 bp
    - Most mammals have 3 billion bp
    - 99% of genome is same from person to person (1 difference per 1000 bp). N’s are different

- Experimental Proof of DNA as genetic material
    - Fred Griffith: Bacterial Transformation Experiments
        - Bacteria changed form and function
        - Studied streptococcus pneumonia
        - R strain is benign and lacks protective capsule

        - S strain is virulent and has polysaccharide capsule
    - Oswald Avery, Colin Macleod, Maclyn McCarthy suggest transforming substance is DNA
        - Remove lipids and carbohydrates from heat-killed S cells so only DNA, RNA, Proteins remain
        - Added enzymes to kill DNA, RNA, Proteins
            - Ex. Proteinases killed protein
        - Add R cells to each flask and see if transformation came (S Cells present)
        - S cells in protein flask and RNA flask
        - NO S cells in DNA flask
        - TRANSFORMATION CANNOT OCCUR UNLESS DNA IS PRESENT SO DNA IS HEREDITY MATERIAL
    - Alfred Hershey and Martha Chase bacteriophage experiments
        - **Labeled 35S of Phage Protein**
        - Centrifuged the proteins and found radioactivity (phage protein) in liquid
        - **Labeled 32P of Phage DNA**
        - T2 labeled proteins remained outside host cells during infection
        - T2 DNA entered host cells
        - **32P NUCLEIC ACID GUIDES VIRAL REPLICATION**

- Bacteriophage is a virus that infects and replicates within a bacterial cell
    - T2 bacteriophage infect e-coli
    - Viral replication is a genetically controlled biological activity