Chapter 12

DNA: The Genetic Material
Scientists wanted to know what made inheritance happen – what molecule?

What they knew:
- Genetic information carried on the chromosome
- Chromosome was made of DNA and protein

Which one was the molecule responsible?
Discovery of the Genetic Material

Nucleus → Chromosome → DNA (short sections of DNA are genes)
Discovery of Genetic Material

- Frederick Griffith (1928)
  - Studied different types of pneumonia bacteria
  - Discovered one could be transformed into the other
  - Found that one strain mixed with the other killed a mouse
    - When cultured – only one strain was found
    - This means that a transformation happened from one type to another
Discovery of the Genetic Material

Rough Strain (II-R)  Smooth Strain (III-S)  Heat-killed Smooth Strain  Rough Strain and Heat-Killed Smooth Strain

Mouse Lives  Mouse Dies  Mouse Lives  Mouse Dies
Oswald Avery (1944)
- Identified what transformed the bacteria
- Exposed bacteria cells to DNA, protein and lipids from the deadly strain
- The DNA changed the bacterial cells, no other macromolecule did
- Showed that DNA was responsible for transformation
- Many scientists still did not believe the results
Discovery of the Genetic Material

Mixture of S Strain bacteria

- DNase
- RNAse
- Lipase
- Protease
- Other

R strain

+ DNA + RNA + Lipid + Protein + Other

Alive!
Dead
Dead
Dead
Dead
Alfred Hershey and Martha Chase (1952)

- Used a bacteriophage (virus that attacks bacteria)
- Made of DNA and protein
- Remember that viruses cannot replicate themselves
  - Must inject themselves into a living cell to reproduce
- Hershey and Chase labeled both parts to see which one transformed the cells
- Used radioactive labeling
  - Trace the DNA and protein as the phages replicated
- The results showed no sulfur in the protein track
- The results showed phosphorus in the DNA track
- **THIS MEANS DNA IS THE GENETIC MATERIAL**