

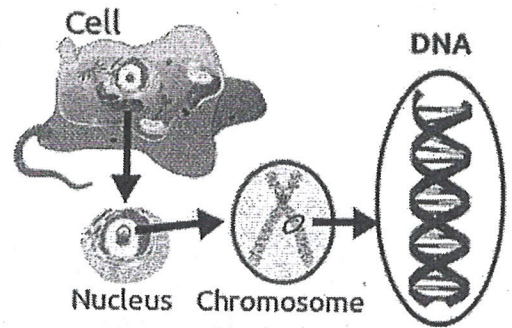
## Unit 6, Topic 1: DNA History and Structure

at the end of this topic, you should be able to...

1. Identify the experiments and scientists involved in the discovery of DNA
2. Describe the structure of the DNA molecule

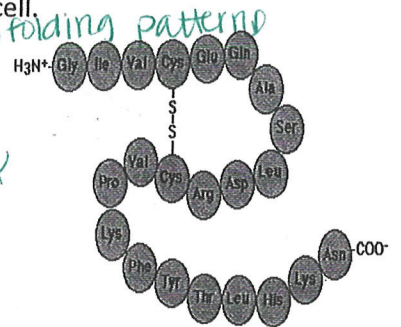
### Review:

- Define monomer: SINGLE building blocks (mono=one)
- Define polymer: chain of repeating units (poly=many)
- Monomer of nucleic acids: Nucleotide
- Who discovered the structure of DNA and what is it?  
Watson & Crick - double helix

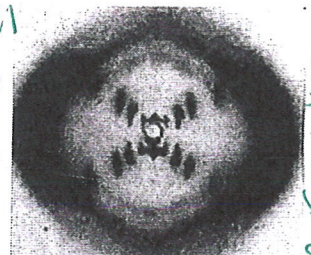
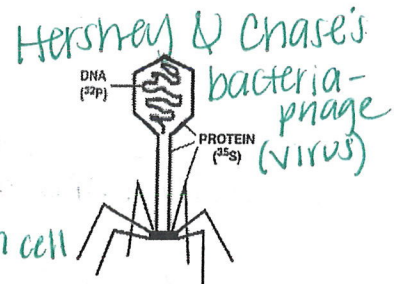


### History of DNA

- Early scientists believed that PROTEIN was the genetic material of the cell.
  - Explain why: it's more complex - does so much for the cell; folding patterns
- Proteins are made of 20 different Amino Acids (monomer)
- Long chains of amino acids make up polypeptides (polymer) →
- Frederick Griffith worked with what type of bacteria?  
the one that causes pneumonia (two strains - one harmful & one harmless)
- What did he find to be true after his experiments with the S and R strains of bacteria?  
He was able to TRANSFORM the DNA  
\*the harmless R strain, when mixed with the heat-killed harmful S strain, became harmful



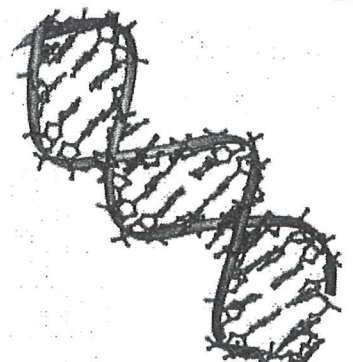
- Griffith's experiment proved that DNA is the cell's genetic material. (suggested)
- How did Hershey and Chase's work with viruses help to support this idea?  
They tagged parts of a virus w/ radioactive labels and then infected bacteria  
- when the protein coat was tagged, NO radioactivity detected in cell  
- when the DNA was tagged, radioactivity detected in cell  
- DNA transferred from virus to cell
- Rosalind Franklin took x-ray diffraction photographs of DNA crystals.
- Watson and Crick used the x-ray diffraction photos to come up with the double helix model of DNA.



R. Franklin - PHOTO 51

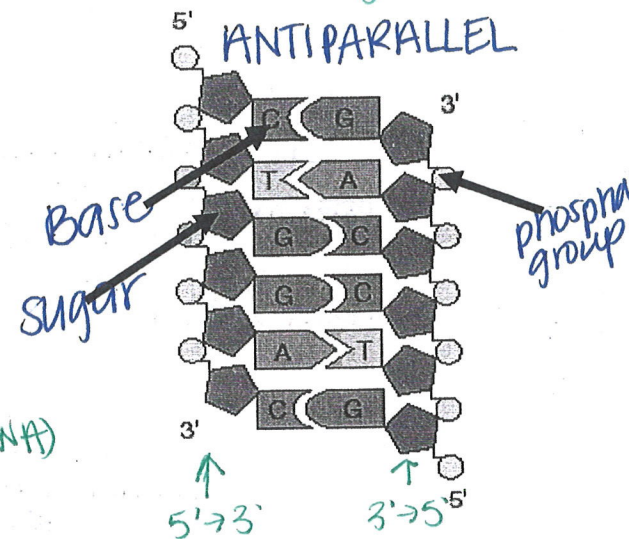
### DNA Structure

- DNA is an example of which type of macromolecule (carbohydrate, lipid, protein, or nucleic acid)? Nucleic acid (= sugars)
- The full name of DNA is Deoxyribonucleic Acid (= phosphate groups)
- DNA is made of monomers called Nucleotides
- What is the function of DNA? store & transmit genetic info (blueprint of life)
- DNA is made of two coiled strands called the double helix



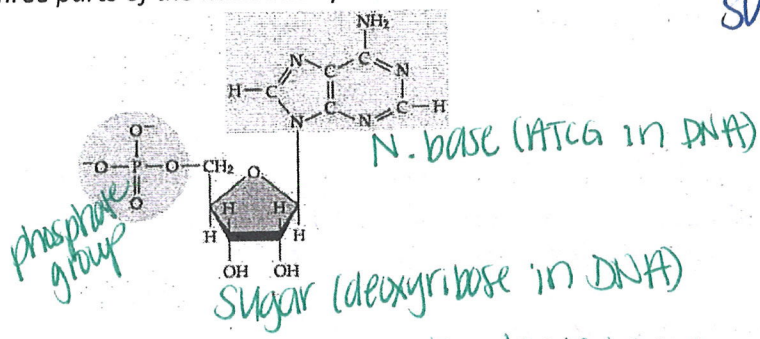
nucleic acid polymers = DNA, RNA

- The "backbone" of each strand is made of sugars called deoxyribose bonded to phosphate (PO<sub>4</sub>) groups.
- The "rungs" of the ladder are made of nitrogenous bases bonded together by weak Hydrogen bonds.
- Label a **sugar**, **phosphate**, and **base** in the picture to the right.



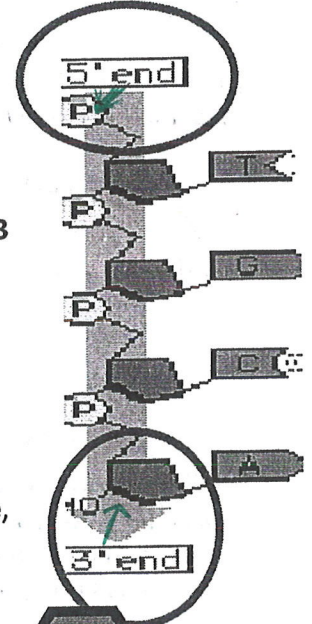
- Each nucleotide is made of 3 parts.
  - Phosphate group (look for P or a circle)
  - 5-carbon sugar (pentagon, in middle)
  - Nitrogenous Base (look for N)

Label the three parts of the nucleotide pictured below:

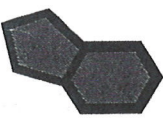


- The part of a DNA strand that ends with the phosphate group is called the 5 prime (5') end.
  - Phosphate = Five
- The part of a DNA strand that ends with the sugar/deoxyribose is the 3 prime (3') end.
- Explain the meaning of the following statement...  
"The strands of the double helix are **antiparallel**."

they are opposite: one runs 5' → 3' and the other runs 3' → 5'

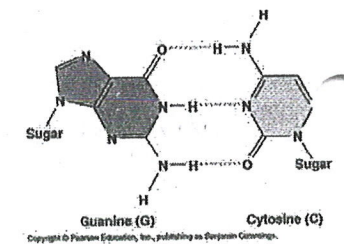
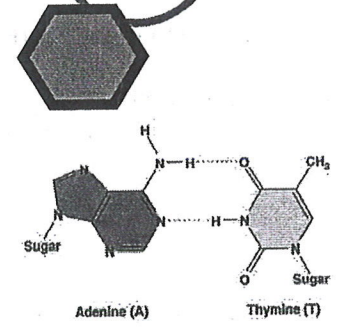


- There are 2 types of nitrogenous bases. Purines have a double-ring structure, and Pyrimidines have a single-ring structure.



- The two purines are Adenine and Guanine.
- The two pyrimidines are Thymine and Cytosine.

- Purines can only pair with pyrimidines. They are connected by weak Hydrogen bonds. (See picture to the right)
- Why would it be a problem for the double structure if purines paired with purines and pyrimidines with pyrimidines?  
uneven spacing → unstable molecule



- The process of specific bases pairing together to form the rungs of the ladder is called complementary base pairing

- Chargaff's rules state that
  - Adenine must pair with Thymine
  - Guanine must pair with Cytosine

- A scientist named **Erwin Chargaff** showed the Amounts of the four bases on DNA. In the DNA of a body cell, he saw the following percentages.

A = 30.3% T = 30.3% G = 19.5% C = 19.9%

- What do you notice about these numbers? A=T C=G

Practice Question #1: If there is 30% adenine, how much cytosine is present? 20%

Practice Question #2: Write out the sequence of a strand complementary to the following strand.

AATCGTACC  
TTAGCATGG

C =  $\frac{20}{40}$

A+T+C+G=100  
A=T C=G  
A=30, T=30  
C+G=40

[[Language Target for Topic 1: I can match the scientists and their research that aided in the discovery of DNA; I can create a model of DNA]]

1. Provide the name of the scientist(s) associated with each image provided. Do so by filling their name(s) in beneath the appropriate picture.

Complete the DNA Structure coloring assignment.

