

## DNA transforms Bacteria

**Frederick Griffith** studied two strains of pneumonia

heat-killed pathogenic + nonpathogenic bacteria = pathogenic bacteria (live disease-causing)

**transformation** change in genotype and phenotype due to assimilation of external DNA by a cell

scientists studied to find the genetic material of chromosomes - protein vs. DNA

## DNA transforms Bacteria (cont.)

**Oswald Avery** also proved that DNA was the molecule that transformed bacteria

## Viruses

DNA or RNA in a protein coat infect by taking over a cell's metabolic machinery

**Bacteriophages** viruses that infect bacteria

**Henry and Chase** showed that DNA was the genetic material that infected the bacteria

Used radioactive isotope markers to label DNA and proteins of phages. Phage DNA entered the bacteria cell, but protein did not.

## Chargaff's Rule

concentration of ... [A] = [T] [C] = [G]

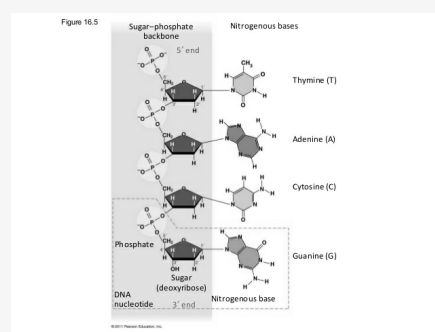
## Rosalind Franklin

**x-ray crystallography** image of DNA produced by x-rays diffracting when passing through DNA fibers

DNA is a double helix, with two anti-parallel sugar-phosphate backbones, and nitrogenous bases in the molecule's interior

**anti-parallel** - subunits run in opposite directions

## DNA is a polymer of nucleotides



components: nitrogenous base, deoxyribose sugar, phosphate group  
bases: adenine, guanine, thymine, cytosine

## Structure of DNA

DNA is a polymer of *nucleotides* connected by **covalent bonds**

4 nitrogenous bases:  
Purines (double ring) [A] [G]  
Pyrimidines (single ring) [C] [T]

**DNA base pairing**  
PURINE always pairs with PYRIMIDINE  
2 of the same would be too wide/narrow

3 *hydrogen bonds* between C and G

2 *hydrogen bonds* between A and T

## DNA Replication

*S phase of Interphase*

DNA made from existing DNA strand

**semiconservative model** one parent strand serves as a template to a complementary strand

half of parent strand is conserved in each *daughter strand*

- Meselson and Stahl

## DNA Replication (cont.)

**origins of replication** where replication of DNA molecule begins

bacterial chromosome circular, *single* origin

eukaryotic chromosome linear, *thousands* of origins

**replication fork** Y-shaped region formed by unwinding of parent strands

- reference drawings to understanding rest of replication -

## Proofreading DNA

**DNA polymerase** proofreads each nucleotide as it's covalently bonded

**mismatch repair** other enzymes remove and repair incorrect nucleotides



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Page 1 of 2.

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### Proofreading DNA (cont)

**nucleotide excision repair** mutated strand is cut out by enzyme **nuclease**, and the gap is filled with DNA polymerase and ligase

- seen in skin cells when correcting thymine dimmers cause by UV rays

### Evolution Significance of DNA Nucleotides

Mutations occur when uncorrected mismatched nucleotides are replicated and passed onto a daughter cell. Usually harmful and permanent genetic changes that support natural selection.

### Replication at Molecule Ends

- reference drawings -

### Inside a Chromosome

eukaryotic cell	one long DNA double helix with large amnt. of protein =	<b>chromatin</b>
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the long DNA fits in the nucleus through packing

- reference drawings -



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Page 2 of 2.

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