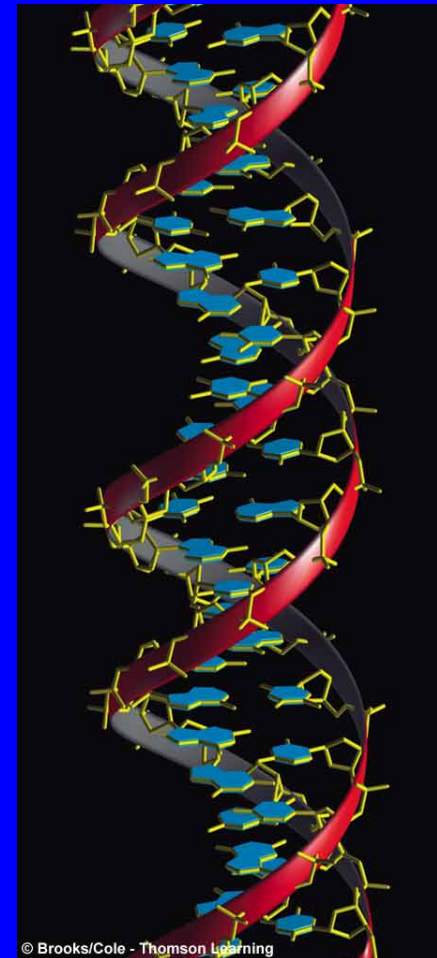


# DNA Structure and Function

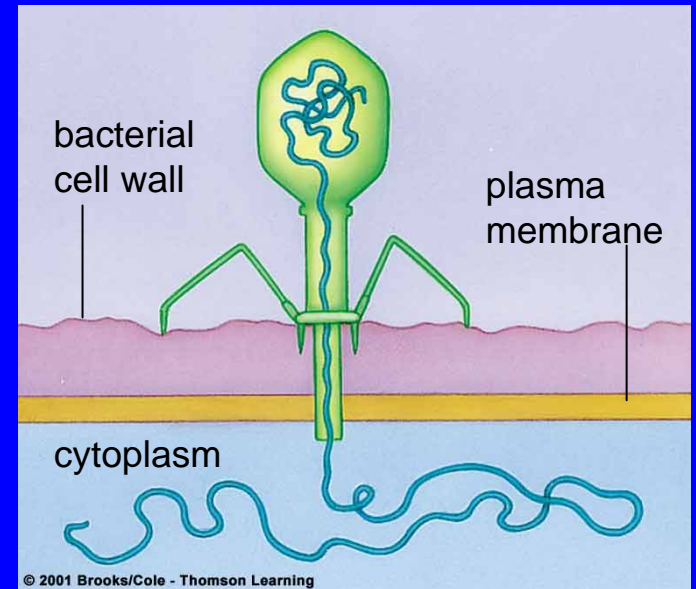
# Structure of the Hereditary Material

- 1950s: DNA the hereditary material
- Structure?
- 1953 - Watson and Crick proposed that DNA is a double helix
- Rosiland Franklin



# Bacteriophages

- Viruses that infect bacteria
- Consist of protein and DNA
- Inject their hereditary material into bacteria

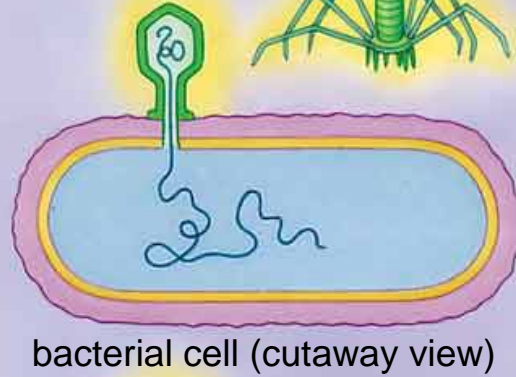
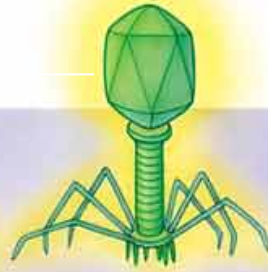


# Hershey & Chase's Experiments

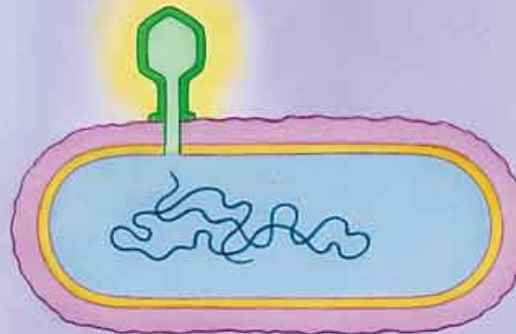
- Labeled bacteriophages
  - Radioactive sulfur
  - Radioactive phosphorus
- Labeled viruses infected bacteria
- Where are the radioactive labels after infection?

# Hershey and Chase Results

virus particle  
labeled with  $^{35}\text{S}$



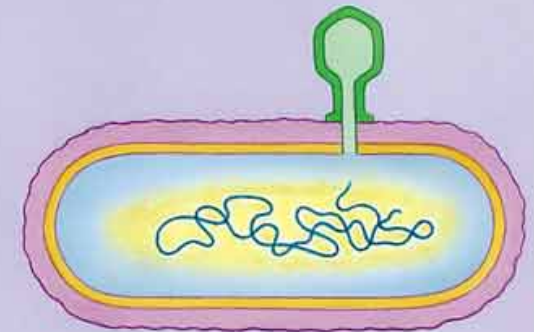
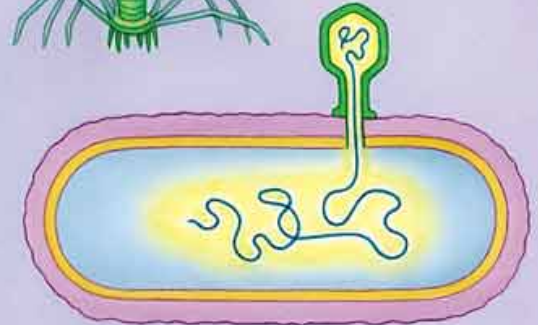
bacterial cell (cutaway view)



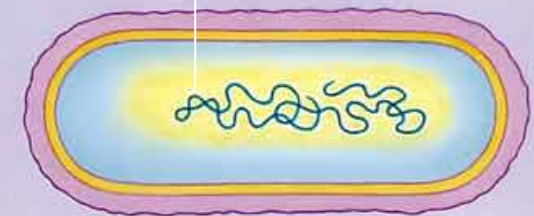
label  
outside cell



virus particle  
labeled with  $^{32}\text{P}$



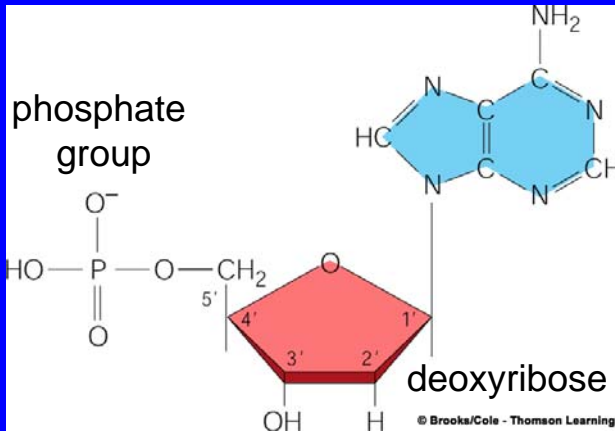
label inside cell



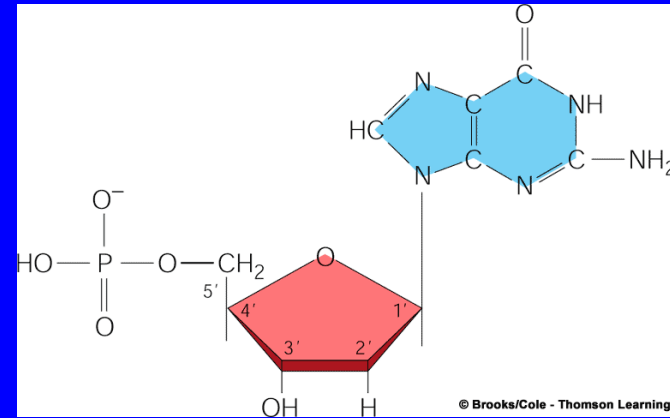
# Structure of Nucleotides in DNA

- Each nucleotide consists of
  - Deoxyribose (5-carbon sugar)
  - Phosphate group
  - A nitrogen-containing base
- Four bases
  - Adenine, Guanine, Thymine, Cytosine

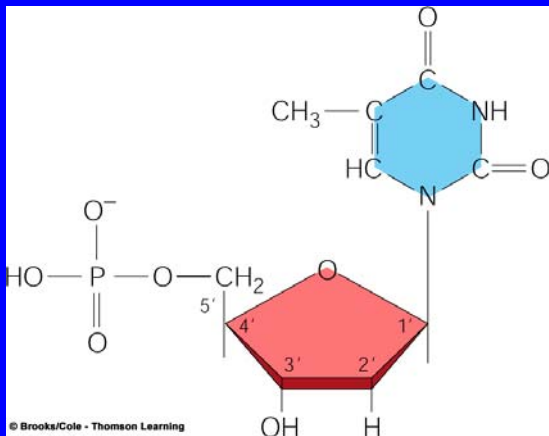
# Nucleotide Bases



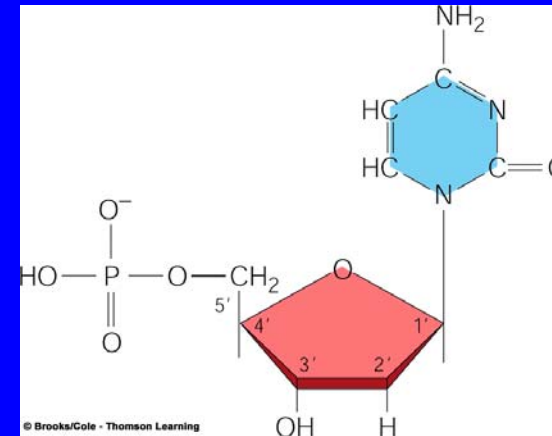
**ADENINE  
(A)**



**GUANINE  
(G)**



**THYMINE  
(T)**



**CYTOSINE  
(C)**

# Composition of DNA

- Adenine pairs with thymine and guanine pairs with cytosine

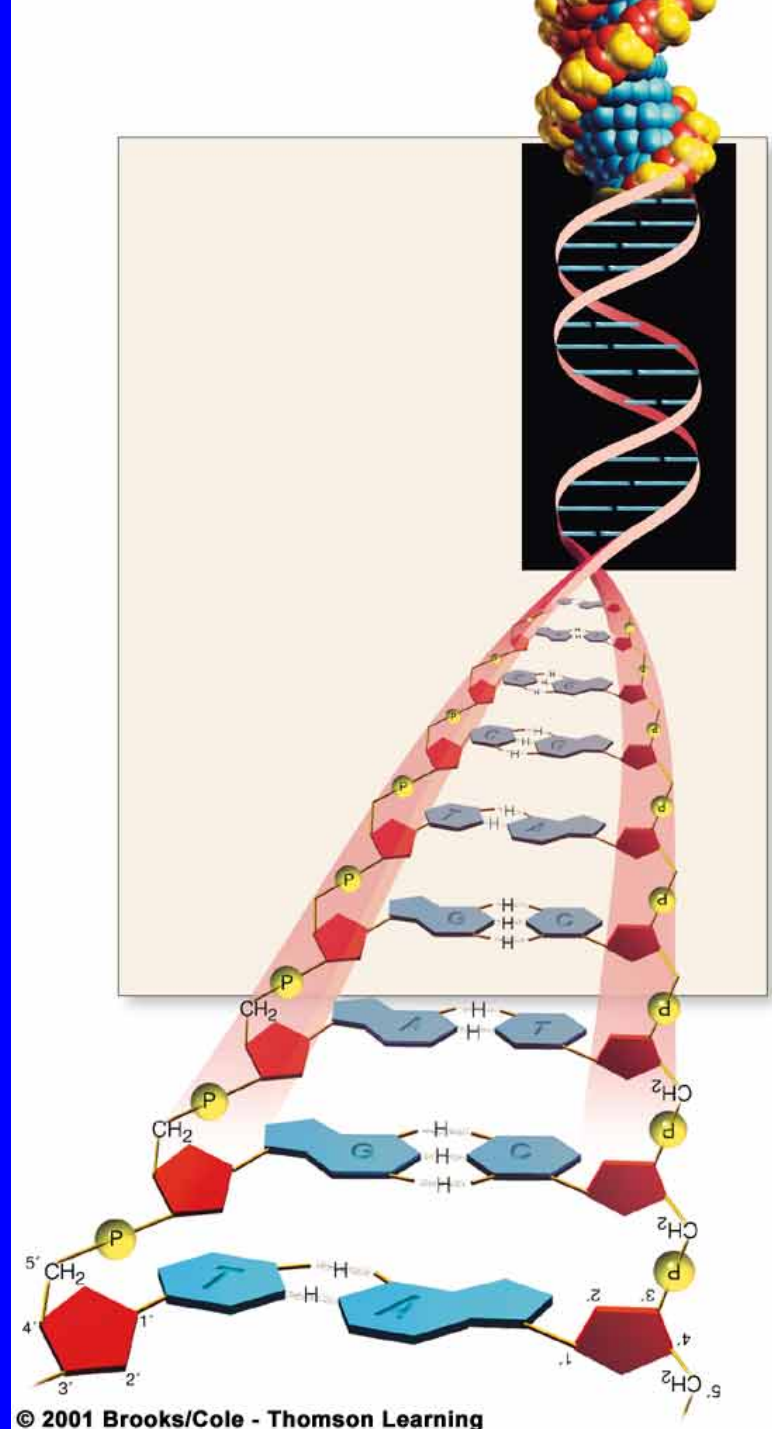
A=T and G=C

# Rosalind Franklin's Work

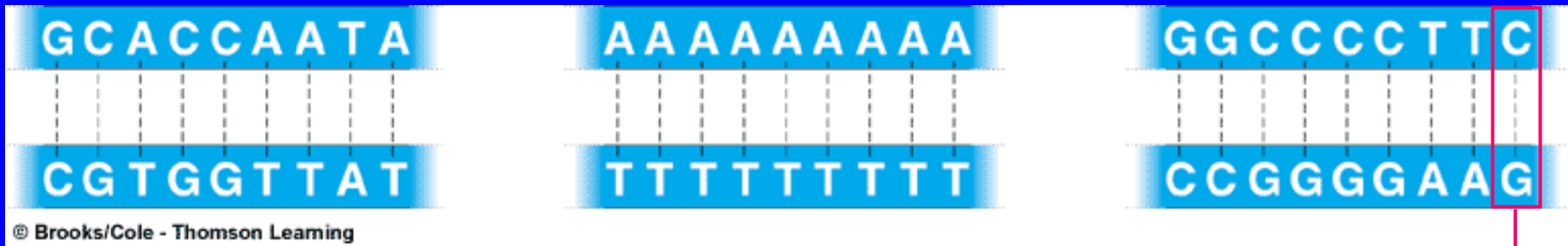
- Expert in x-ray crystallography
- Examine DNA fibers
- Concluded that DNA was some sort of helix

# Watson-Crick Model

- DNA consists of two nucleotide strands
- Opposite directions
- Held together by hydrogen bonds between bases
- A binds with T and C with G
- Double helix molecule



# Base Pairing



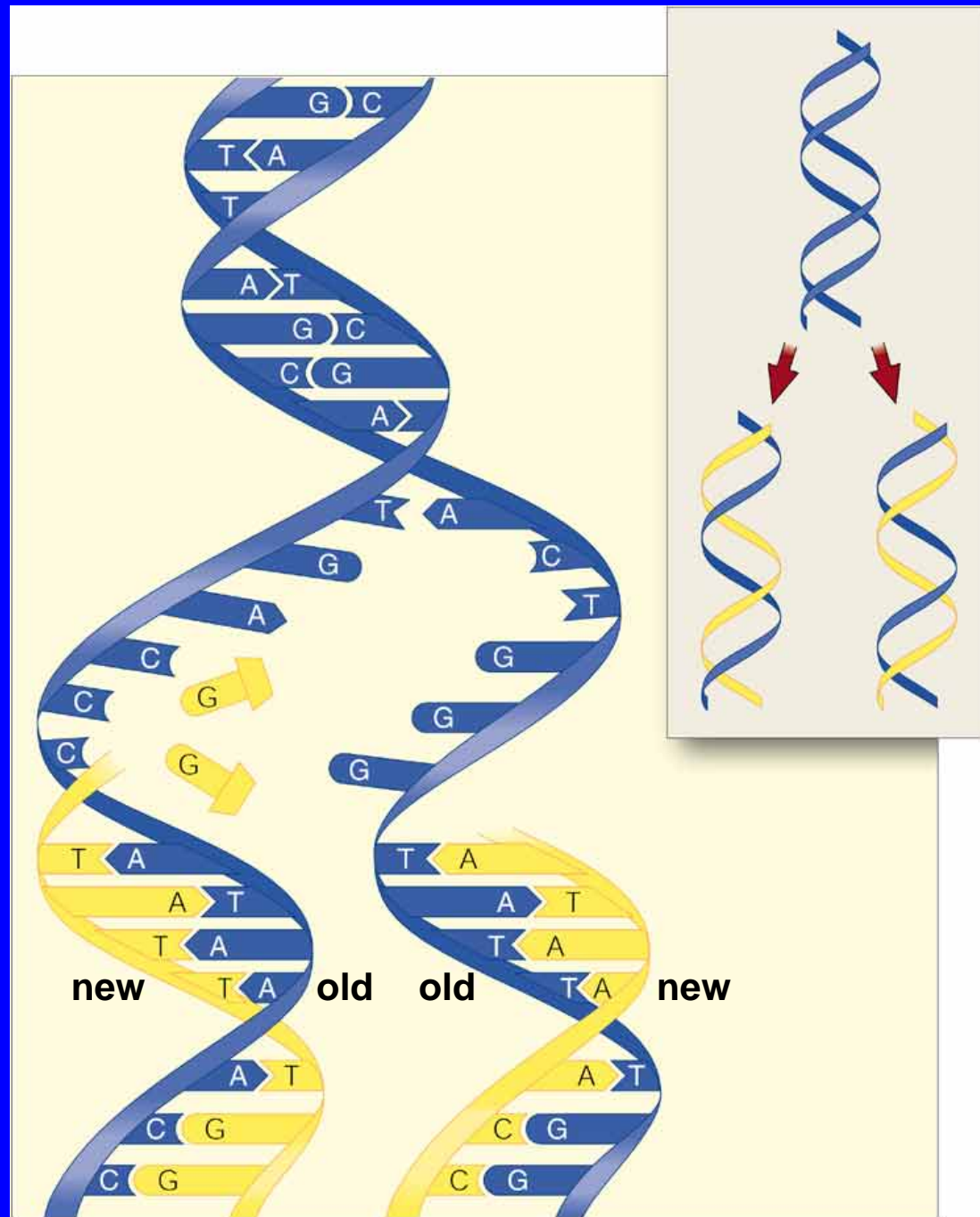
one base pair

# DNA Structure and Duplicating

- Hydrogen bond are easily broken
- Each strand serves as template for new strand

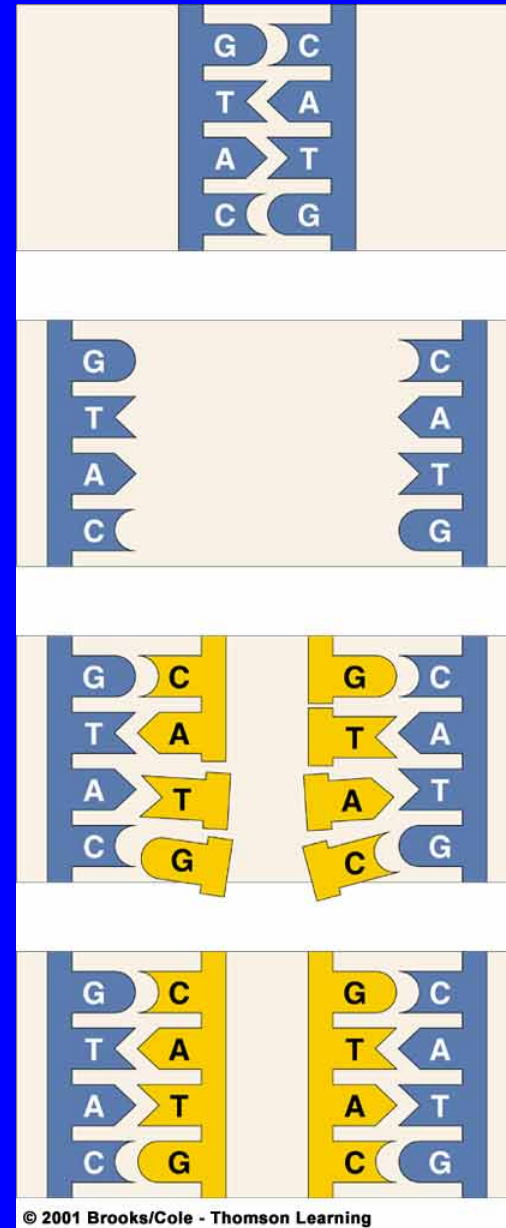
# DNA Replication

- Each parent strand remains intact
- Every DNA molecule is half “old” and half “new”



# Base Pairing During Replication

Free nucleotides  
base pair with  
complementary  
partner

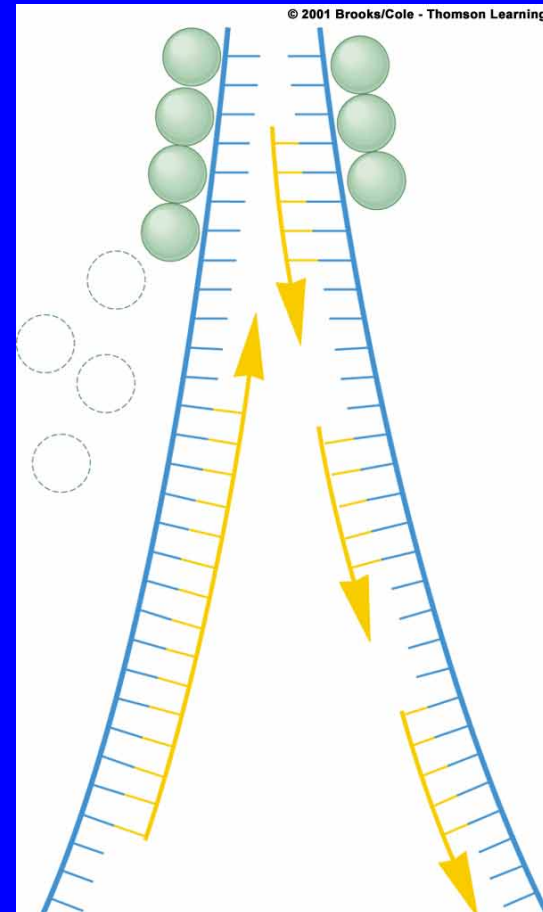


# Enzymes in Replication

- Enzymes unwind strands
- DNA polymerase attaches complementary nucleotides
- DNA ligase fills in gaps
- Enzymes wind strands together

# Continuous and Discontinuous Assembly

Strands can only be assembled in the 5' to 3' direction



# DNA Repair

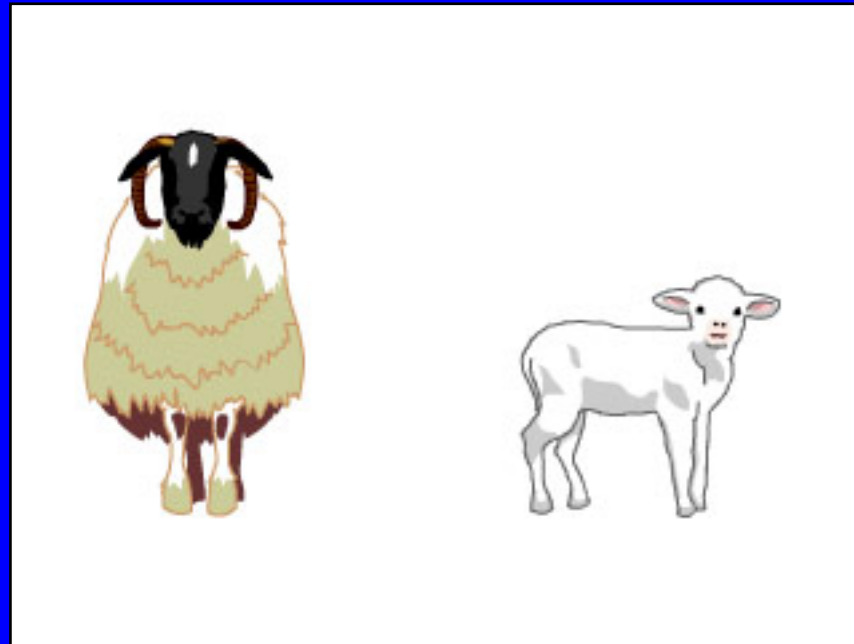
- Mistakes can occur during replication
- DNA polymerase reads correct sequence from complementary strand
- Repairs mistakes in incorrect strand with DNA ligase

# Cloning

- A genetically identical copy of an individual
- Researchers have been creating clones for decades
- These clones were created by embryo splitting

# Dolly: Cloned from an Adult Cell

- Differentiated cells could be used for cloning
- Sheep udder cell combined with enucleated egg cell
- Dolly genetically identical to sheep that donated udder cell



Click to view  
animation.

# More Clones

- Mice
- Cows
- Pigs
- Goats
- Guar (endangered species)