

**Today:**

- 1. Finish presentation of biotechniques from yesterday's lecture.**
- 2. Finish DNA replication of the chromosomal ends (telomeres).**
- 3. Finally cover DNA mutations!**
- 4. Introduction of the cell cycle.**

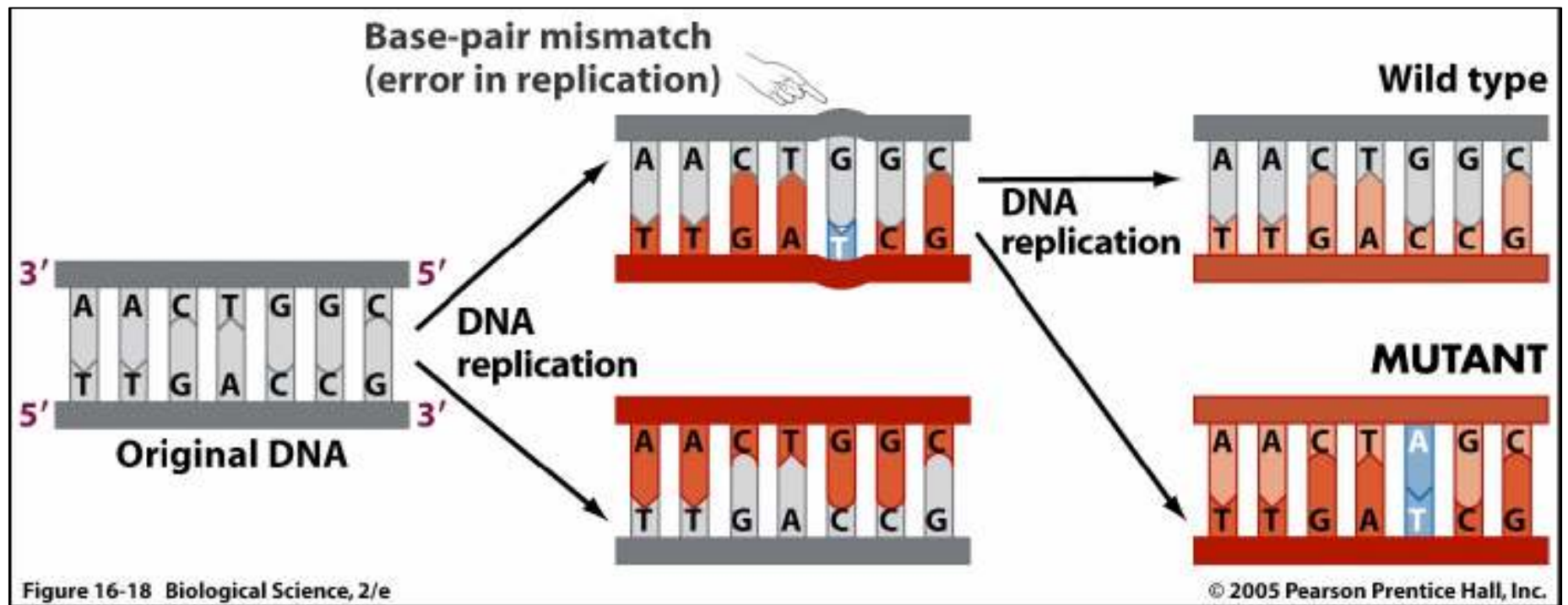
# Consequences of Mutational Alterations

## Types of point mutations

	Definition	Example	Consequence
	Original DNA sequence —	TAT TGG CTA GTA CAT	
	Original polypeptide —	Tyr Trp Leu Val His	
<b>Silent</b>	Change in nucleotide that does not change amino acid specified by codon	<div> <div>TAC</div> <div>TGG</div> <div>CTA</div> <div>GTA</div> <div>CAT</div> </div> <div> <div>Tyr</div> <div>Trp</div> <div>Leu</div> <div>Val</div> <div>His</div> </div>	Change in genotype but no change in phenotype
<b>Missense (Replacement)</b>	Change in nucleotide that changes amino acid specified by codon	<div> <div>TAT</div> <div>TGT</div> <div>CTA</div> <div>GTA</div> <div>CAT</div> </div> <div> <div>Tyr</div> <div>Cys</div> <div>Leu</div> <div>Val</div> <div>His</div> </div>	Change in primary structure of protein
<b>Nonsense</b>	Change in nucleotide that results in early stop codon	<div> <div>TAT</div> <div>TGA</div> <div>CTA</div> <div>GTA</div> <div>CAT</div> </div> <div> <div>Tyr</div> <div>STOP</div> </div>	Premature termination—polypeptide is truncated
<b>Frameshift</b>	Addition or deletion of a nucleotide	<div> <div>TAT</div> <div>TCG</div> <div>GCT</div> <div>AGT</div> <div>ACA</div> <div>T</div> </div> <div> <div>Tyr</div> <div>Ser</div> <div>Ala</div> <div>Ser</div> <div>Thr</div> </div>	Reading frame is shifted—massive missense

# MUTATIONS

## Point Mutations Occur During DNA Synthesis

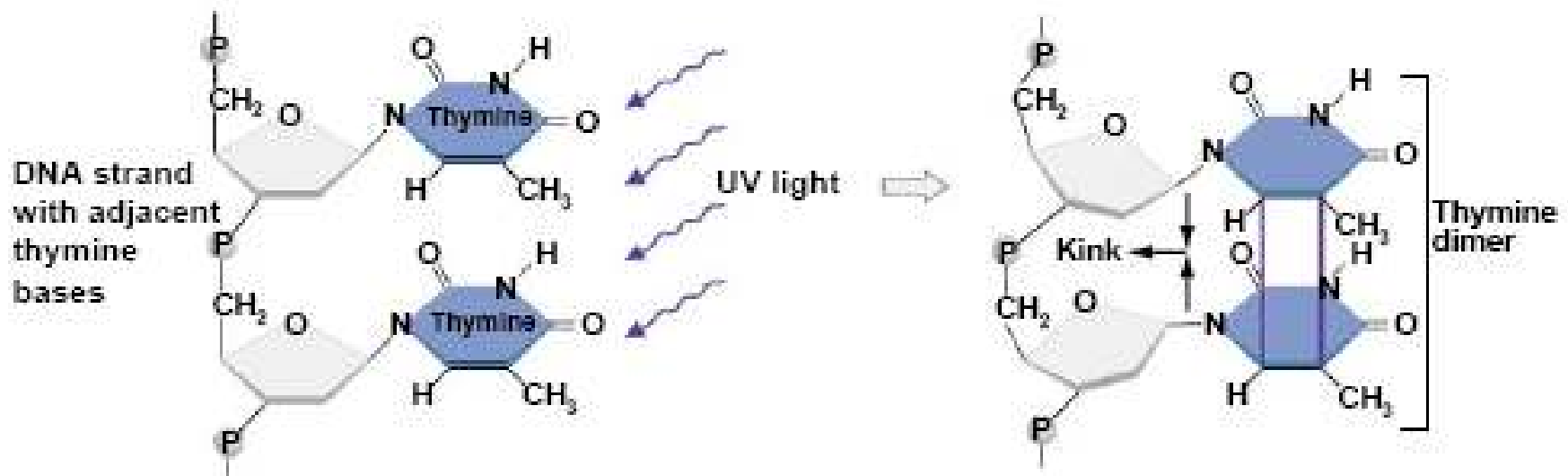


DNA Polymerases have proof-reading ability and can fix these.

# Mutagens cause other kinds of mutations

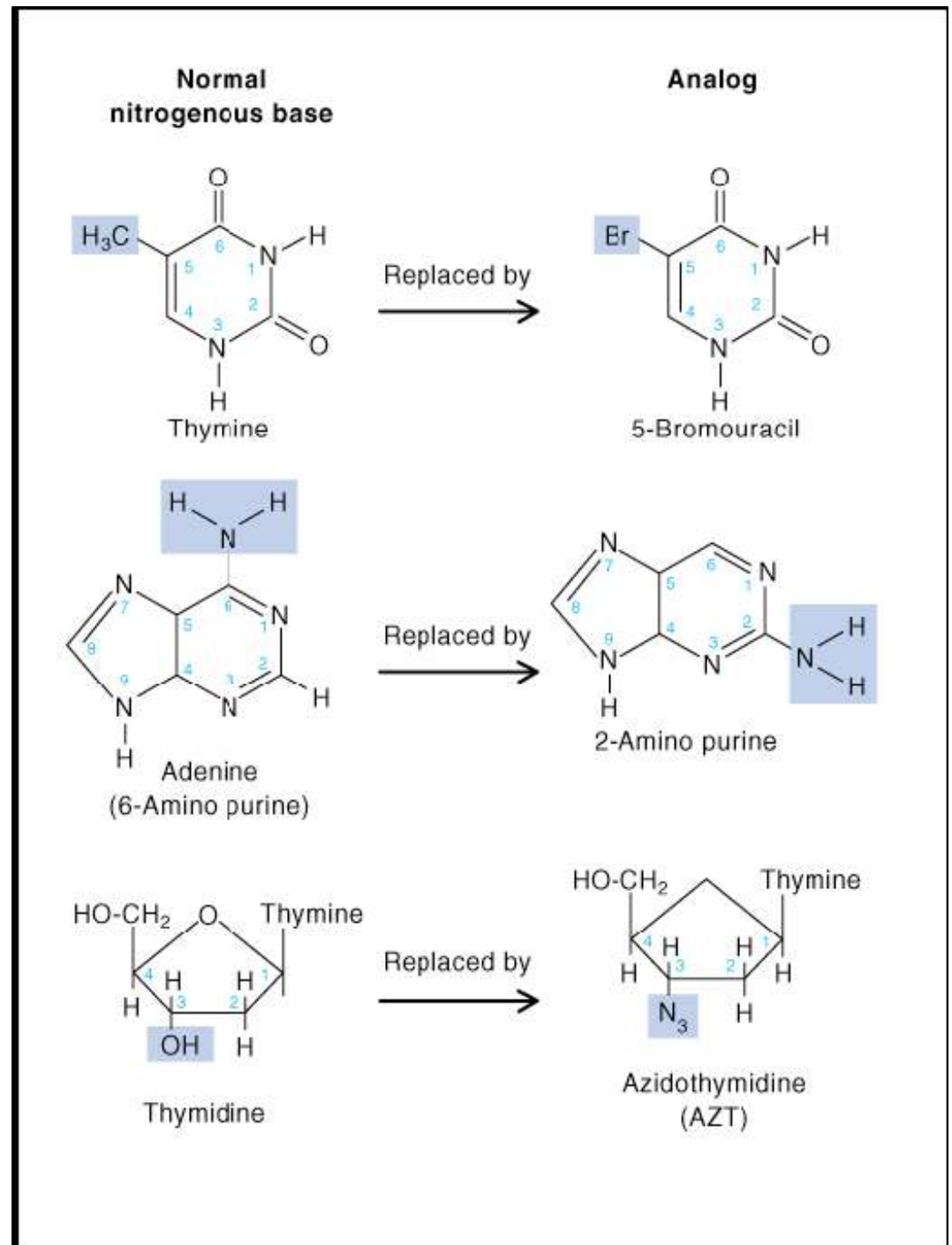
## Radiation

eg., UV radiation causes thymine crosslinking



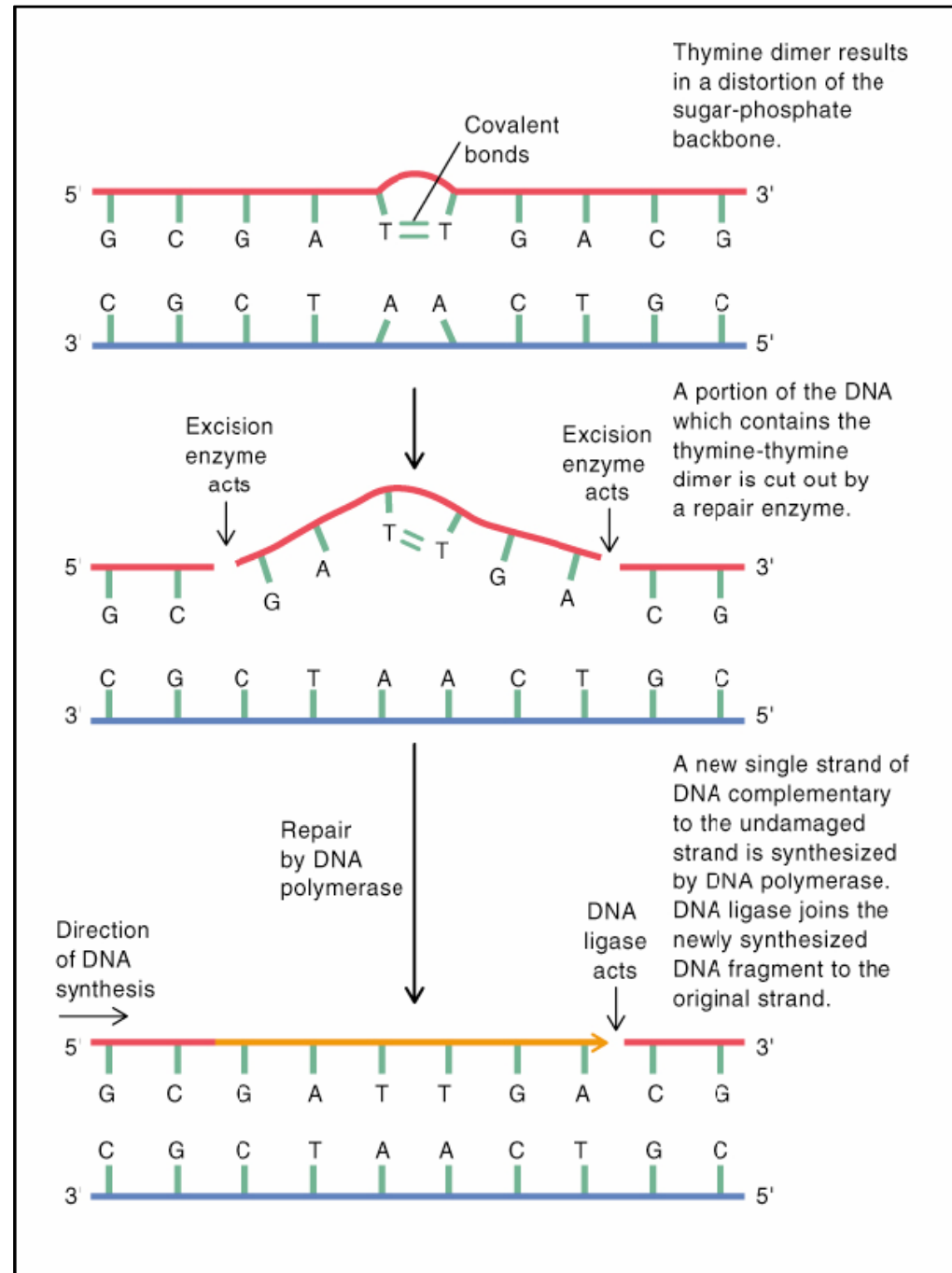
# Chemical Mutagens

- Modifying agents
- Base analogs
- Intercalating agents (ethidium bromide)



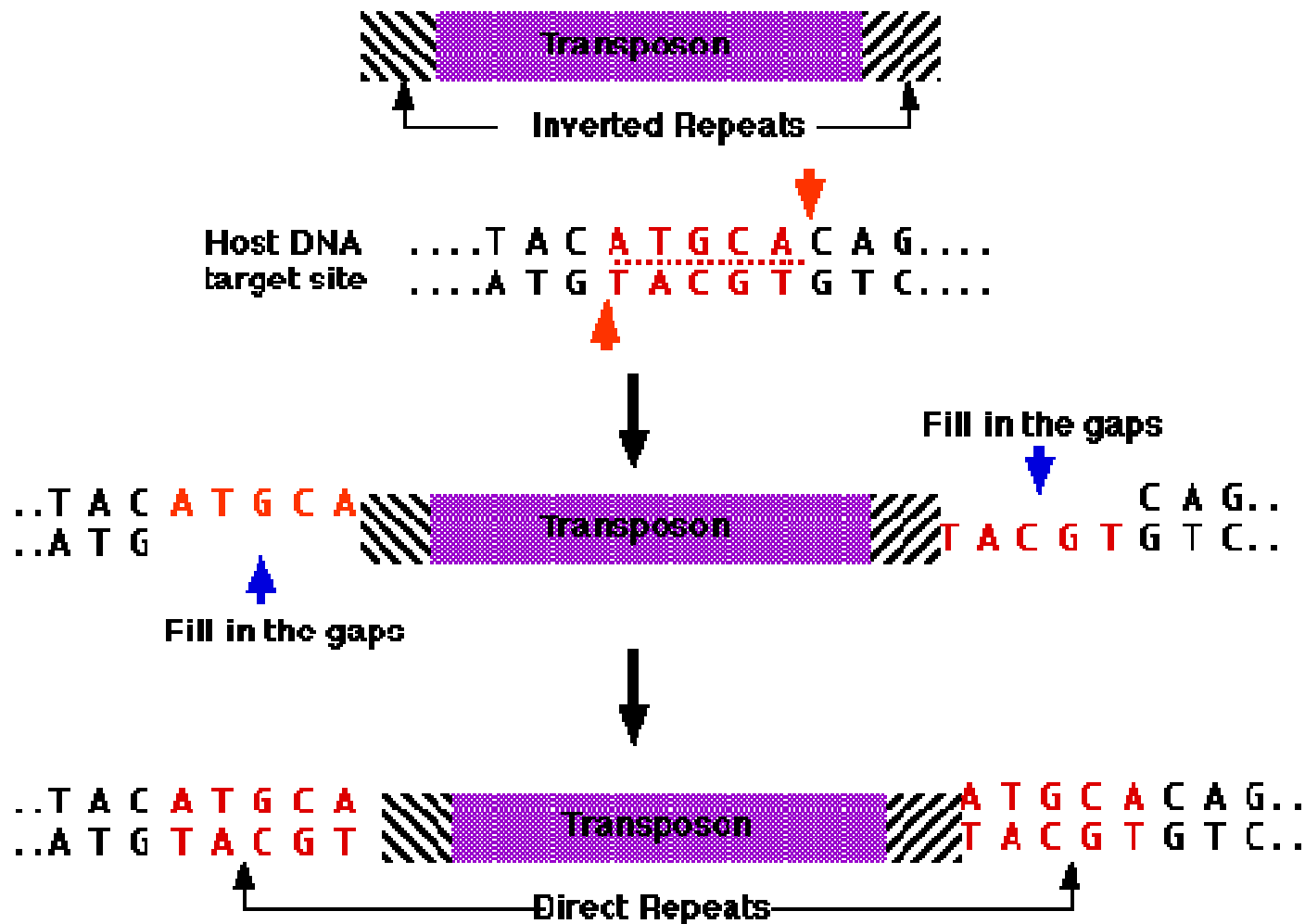
**Mutations of these kind can be fixed by excision repair**

**Proteins recognize kink in DNA and cut out the damaged section so that DNA polymerase and ligase can fix it.**



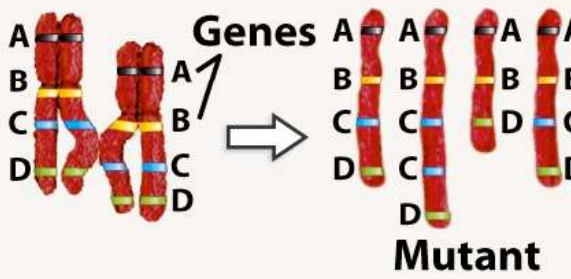
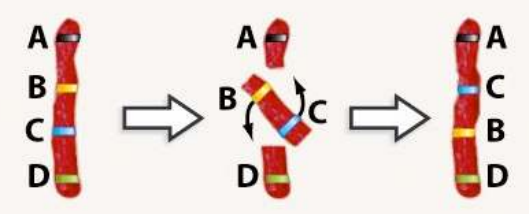
# Biological Mutagens

## Transposable Elements “Jumping Genes”



# Other Types of Mutations

## Other types of mutations

	Definition	Example	Consequence
<b>Gene duplication</b>	Addition of a small chromosome segment due to an error during crossing over at meiosis I—homologs do not align correctly	 <p>The diagram shows two homologous chromosomes, each with genes A, B, C, and D. An arrow indicates a crossing over event where the chromosomes misalign. The resulting mutant chromosome contains two copies of the A-B-C-D segment.</p>	Produces an extra copy or deletion of one or more genes. Families of related genes arise by gene duplication.
<b>Chromosome inversion</b>	Change in a chromosome segment when DNA breaks in two places, flips, and rejoins	 <p>The diagram shows a single chromosome with genes A, B, C, and D. An arrow indicates a break in the chromosome between B and C. The segment B-C is shown flipping 180 degrees and then rejoining. The final chromosome has the gene order A, D, C, B.</p>	Changes gene order along chromosome. Other types of chromosome breaks can lead to deletion or addition of chromosome segments.