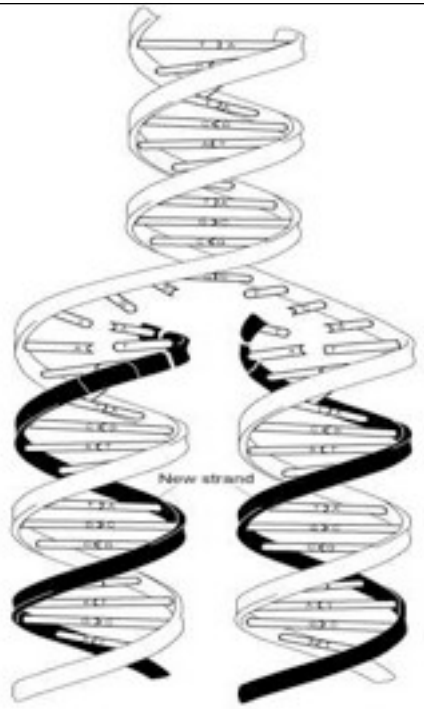


DNA Replication

Life Science: Molecular

Replication Topics

- Replication
- Helicase
- DNA Polymerase
- Ligase
- Okazaki Fragment

"It has not escaped our notice that the pairing we have postulated immediately suggests a possible copying mechanism for the genetic material."

- James Watson and Francis Crick

DNA Replication

- **Replication** is the process of copying the DNA.
- Before a cell can divide, the DNA must be copied so that each cell receives its own set of instructions.

Chargaff's Rules

- Erwin Chargaff discovered...

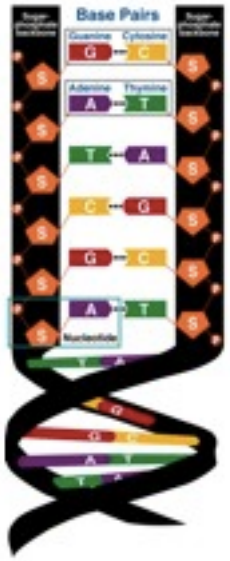
1. THE COMPOSITION OF DNA VARIED FROM ONE SPECIES TO ANOTHER, IN PARTICULAR IN THE RELATIVE AMOUNTS OF THE BASES A, C, T, G.
2. IN ANY DNA, THE NUMBER OF A'S WAS THE SAME AS THE NUMBER OF T'S; SIMILARLY, THE NUMBER OF C'S WAS EQUAL TO THE NUMBER OF G'S.

WHAT DID THIS MEAN? CHARGAFF COULDN'T SAY..

Source of DNA	A	T	G	C
Streptococcus	29.8	31.6	20.5	18.0
Yeast	31.3	32.9	18.7	17.1
Herring	27.8	27.5	22.2	22.6
Human	30.9	29.4	19.9	19.8

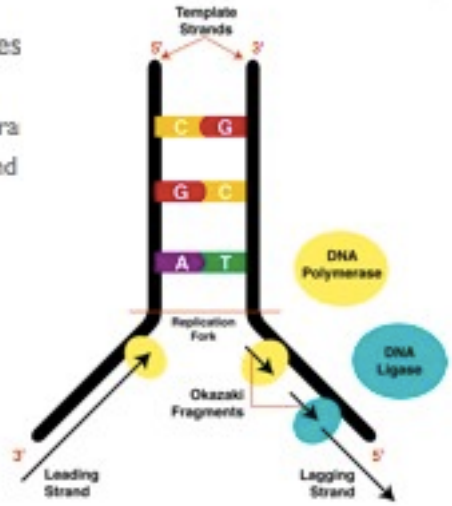
Complementary Base Pairing

- Two complete DNA strands can be created from a single DNA molecule by matching complementary bases.



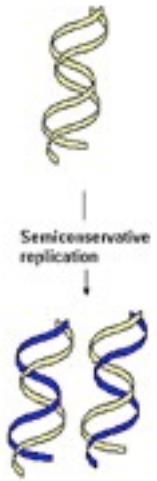
Replication Enzymes

- Replication requires enzymes
  - **Helicase** unwinds DNA
  - **Polymerase** copies each stra
  - **Ligase** joins the lagging strand



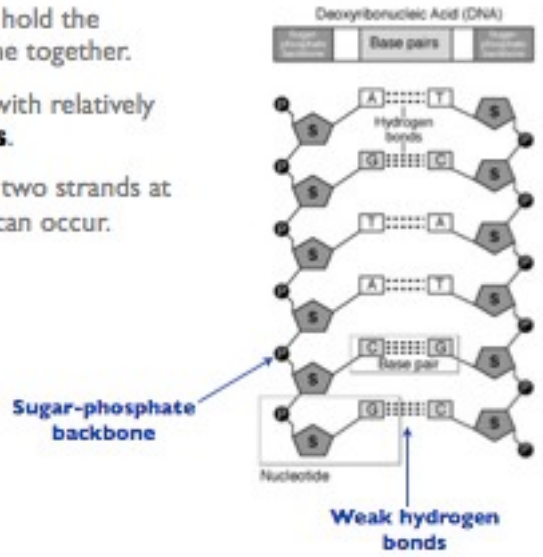
DNA Replication is Semi-Conservative

In **semi-conservative** replication DNA one old strand is always conserved in the new molecule.



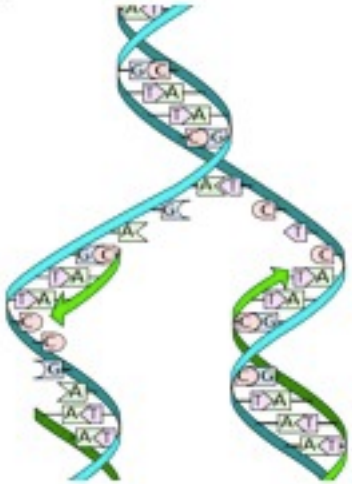
Separating the Strands

- Strong **covalent** bonds hold the phosphate-sugar backbone together.
- Bases are held together with relatively weak **hydrogen bonds**.
- **Helicase** separates the two strands at the bases, so replication can occur.

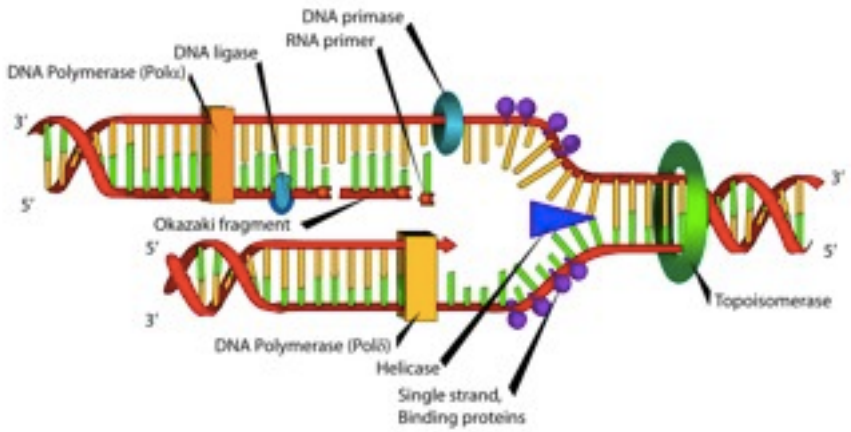


Copying the Strands

- **DNA polymerase** copies the separated strands by matching up complementary bases.
- Adenine always pairs with Thymine
  Cytosine always pairs with Guanine



Connecting the Fragments



Which strand is leading? Which is lagging?