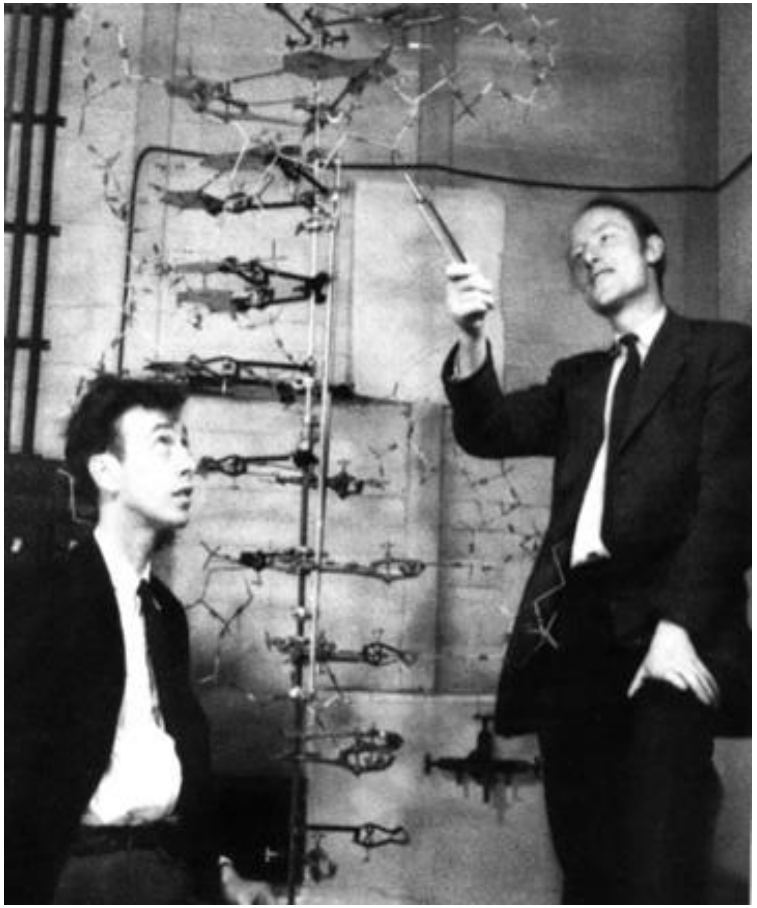
Molecular Biology

Structure & Function of Nucleic Acids, Replication, Transcription & Translation

History



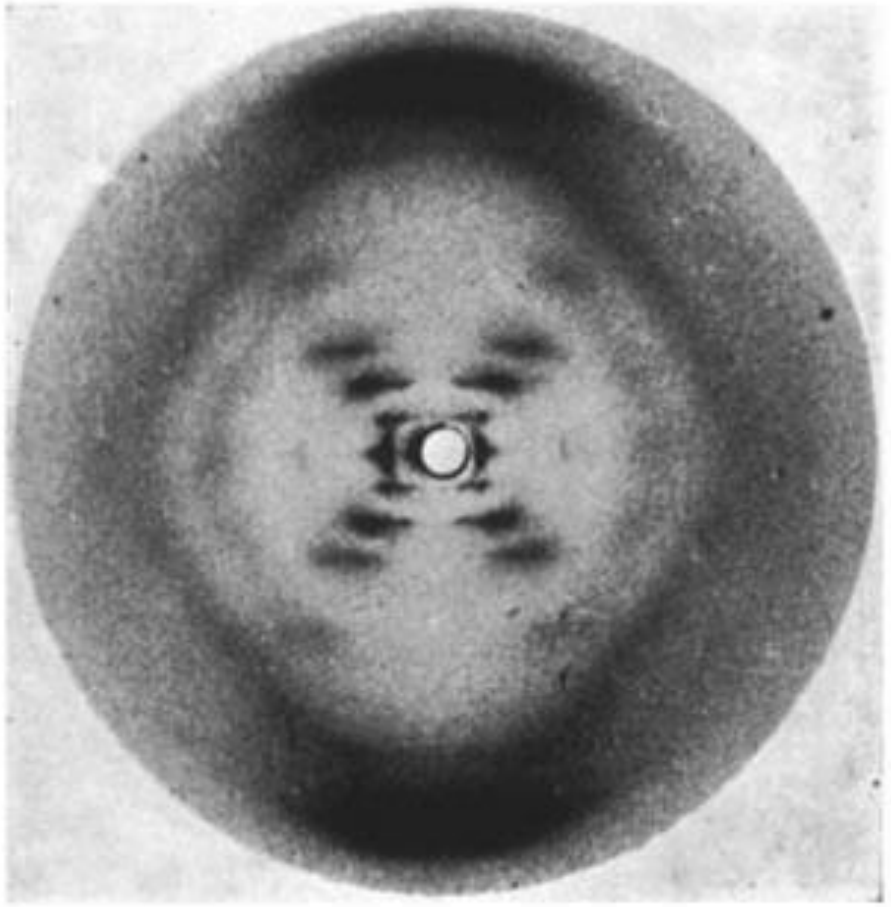
J. Watson & F. Crick

- Discovered the structure of DNA in 1953.

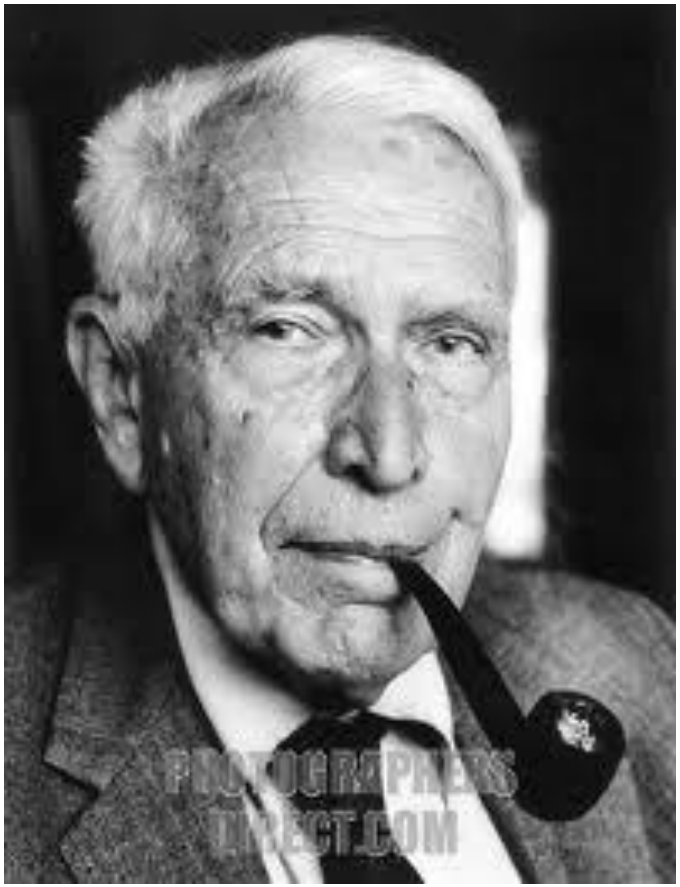
Maurice Wilkins & Rosalind Franklin

- M. Wilkins and R. Franklin produced pictures (X-ray diffraction) that helped Watson and Crick determine the helical structure of DNA

‘Photo 51’



Erwin Chargaff

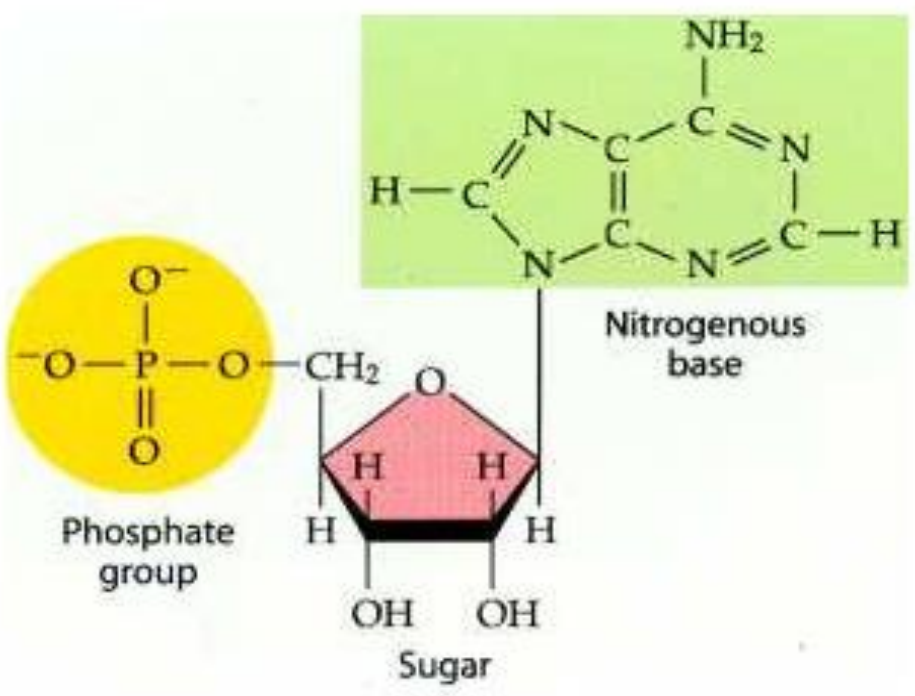


Chargaff's Rules

- The amount of Adenine (A) always equals the amount of Thymine (T)
- The amount of Guanine (G) always equals the amount of Cytosine (C)
- The discovery of these facts helped Watson & Crick determine that A pairs with T and that G pairs with C

Structure of Nucleic Acids: DNA & RNA

- Nucleic Acids are made of nucleotides.
- Nucleotides have 3 parts: sugar, phosphate, nitrogen base

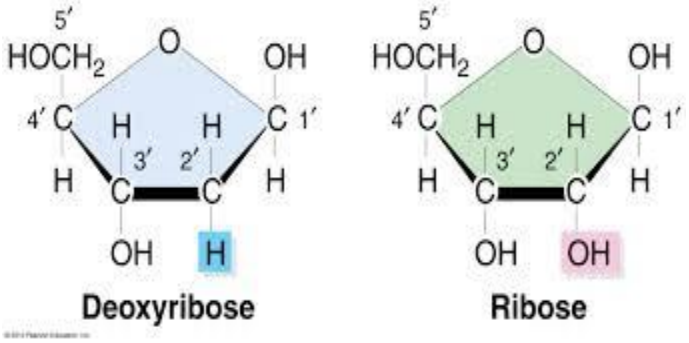


Function of Nucleic Acids: DNA & RNA

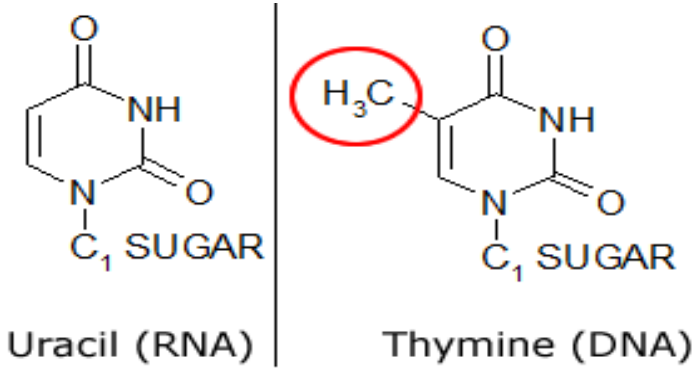
- Nucleic Acids store and transmit information needed to make proteins
- This information is in the form of a sequence of nitrogen bases

Structure of DNA Nucleotides

- 3 parts:
  - Sugar—deoxyribose
  - Phosphate
  - Nitrogen base



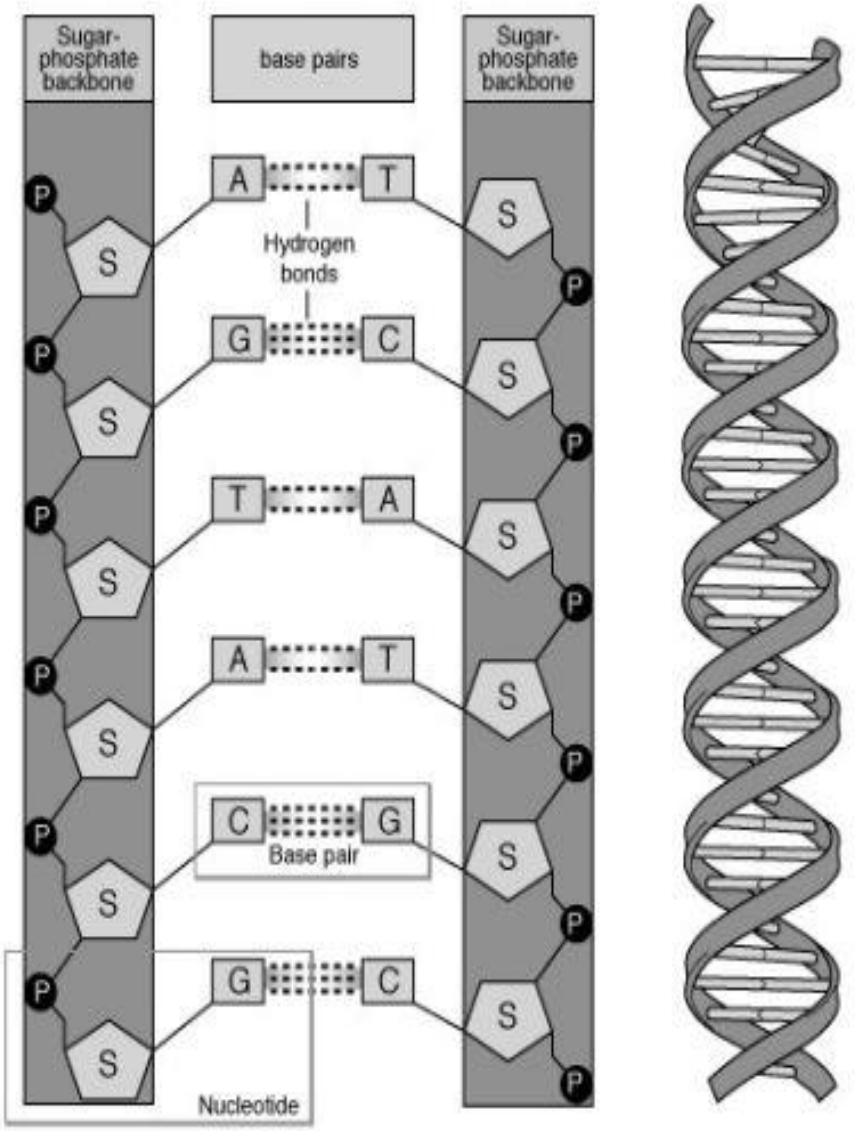
- There are 4 types of nitrogen bases in DNA
  - Adenine: A
  - Thymine: T
  - Guanine: G
  - Cytosine: C



- Chargaff's Rules: A pairs with T & G pairs with C

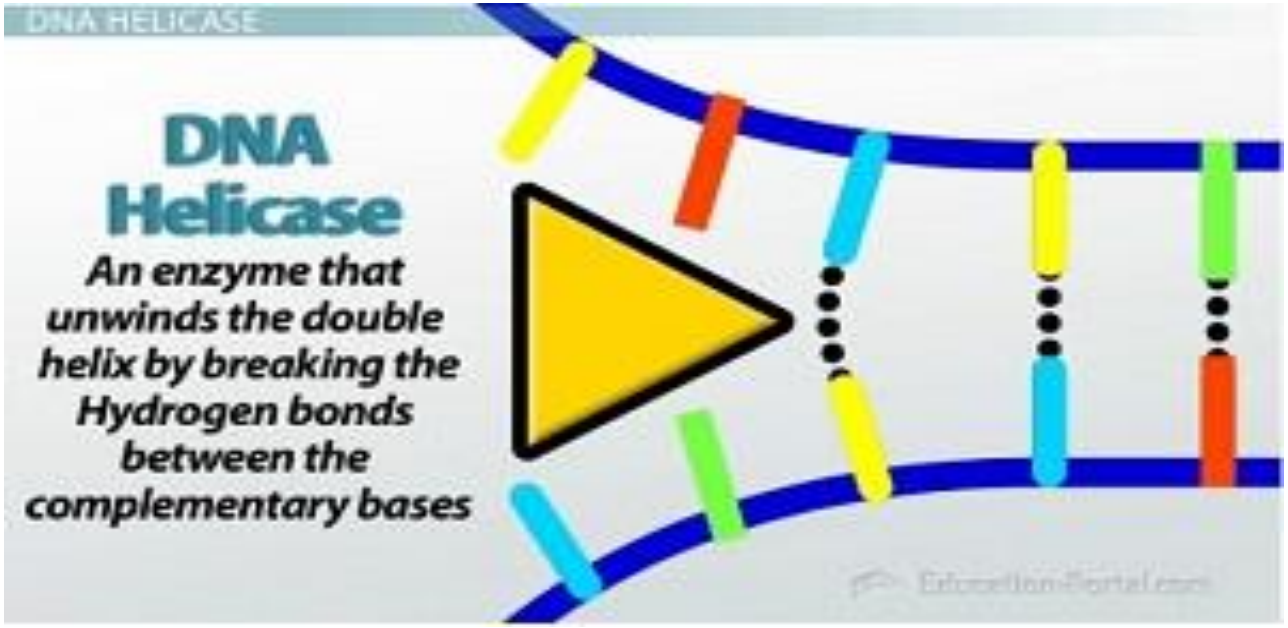
Structure of a DNA Molecule

- Nucleotides link together to form strands
- DNA is a <u>double-stranded molecule</u>, i.e. it is made of 2 strands joined together by hydrogen bonds between bases
- The strands are twisted around each other into a spiral shape called a <u>double helix</u>

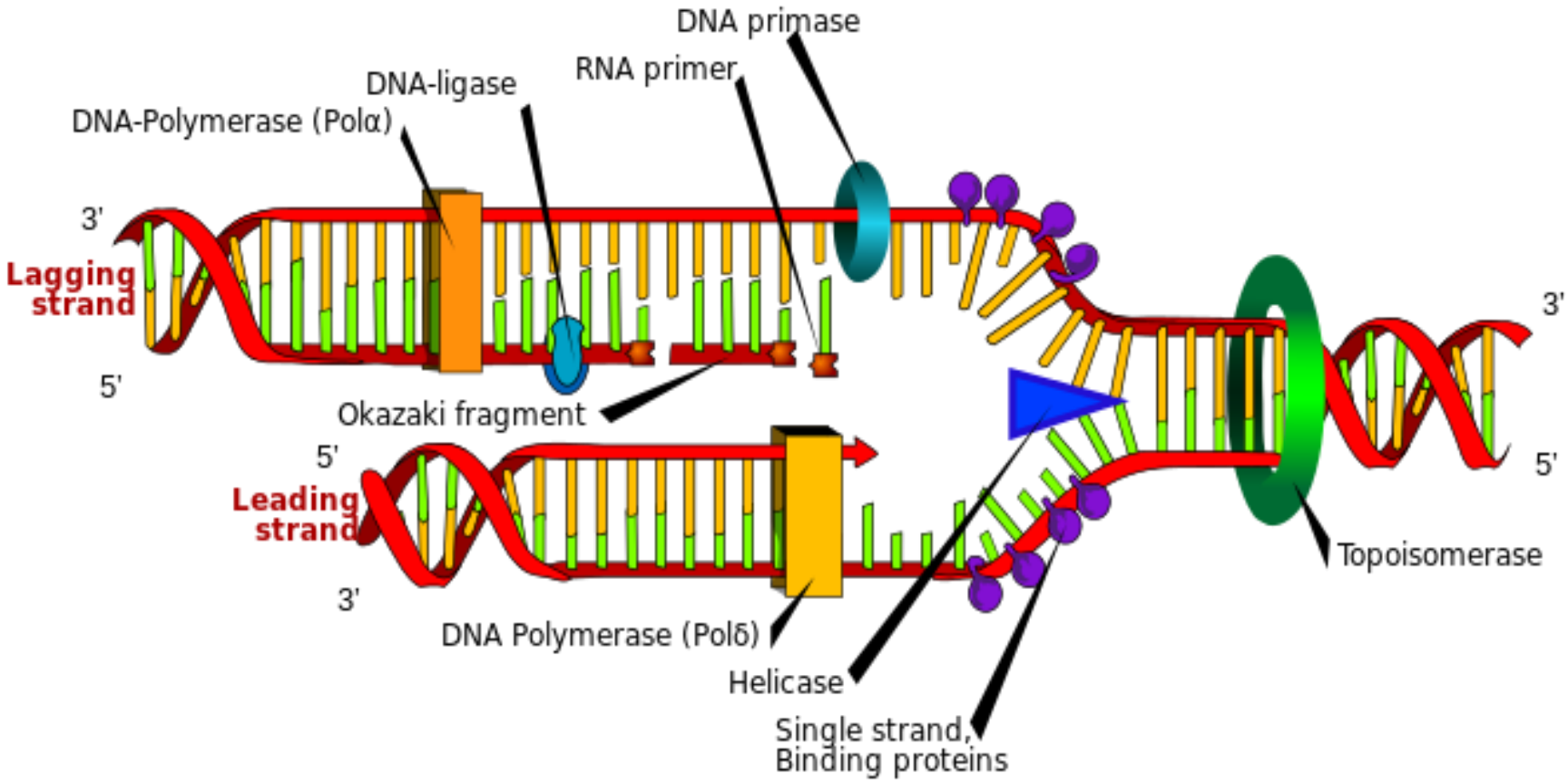


DNA Replication

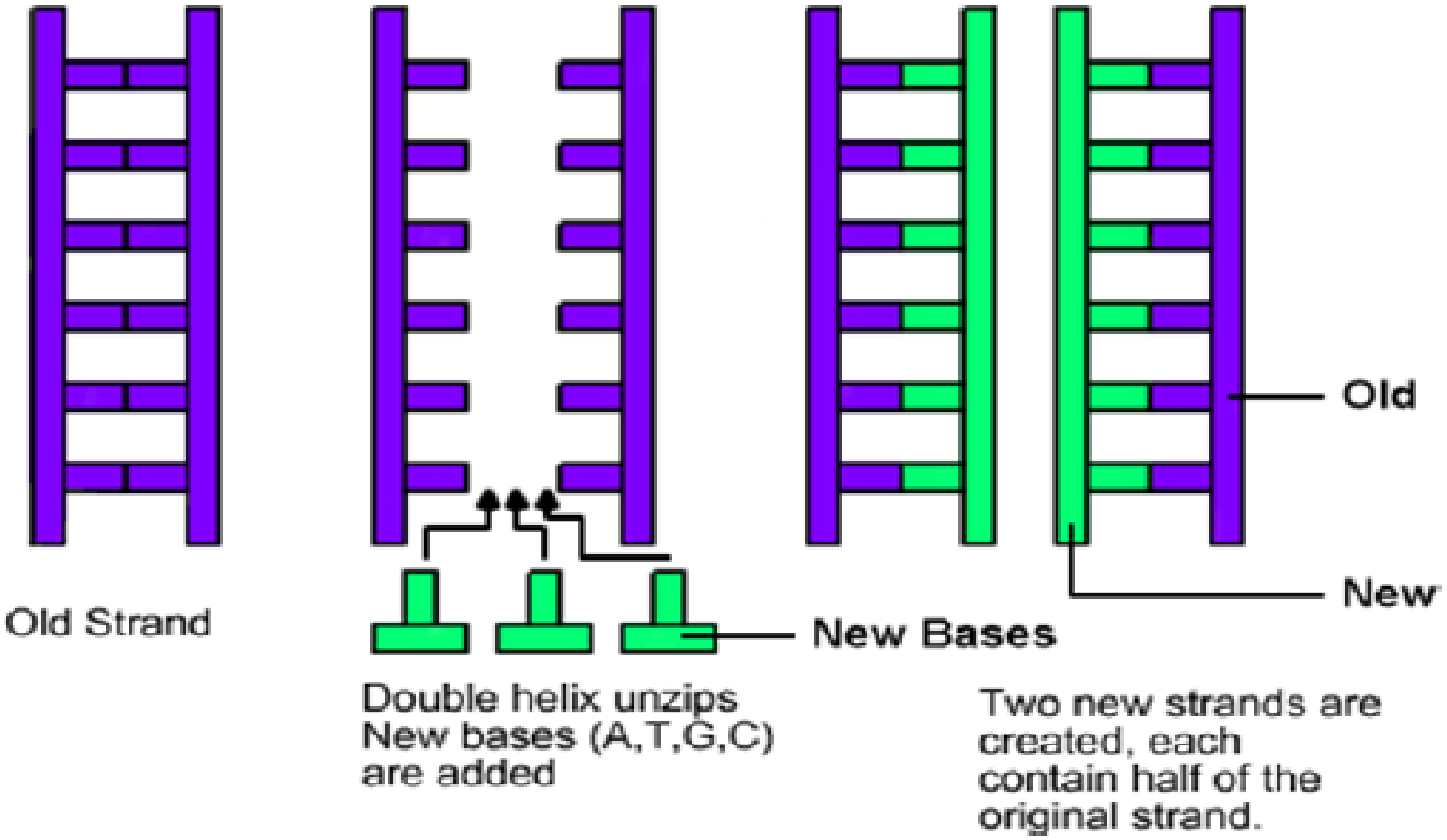
- Helicase separates the 2 strands of a DNA molecule by breaking the hydrogen bonds between nitrogen bases. This creates two single strands with exposed nitrogen bases



- Once the strands are separated, DNA Polymerase adds complementary nitrogen bases to the newly exposed bases of the original DNA molecule

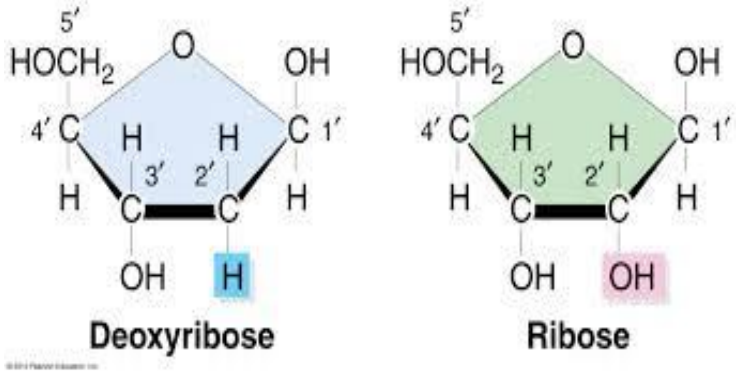


- The end result is two new molecules of DNA, each containing one half of the original DNA molecule

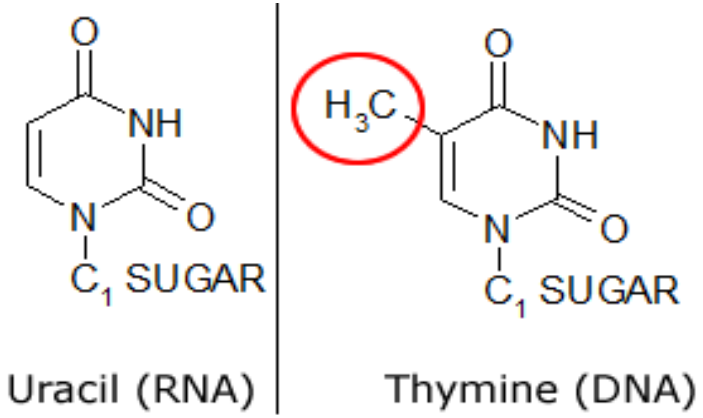


Structure of RNA Nucleotides

- 3 parts:
  - Sugar—<u>ribose</u>
  - Phosphate
  - Nitrogen base



- There are 4 types of nitrogen bases in DNA
  - Adenine: A
  - Uracil: <u>U</u>
  - Guanine: G
  - Cytosine: C



- Base Pairing Rules: A pairs with U & G pairs with C

Structure of an RNA Molecule

- Again, nucleotides are linked together to form strands. RNA is a single-stranded molecule
- Sometimes bases on the same strand of RNA will pair with each other creating a specific double-stranded structure to accomplish a specific function