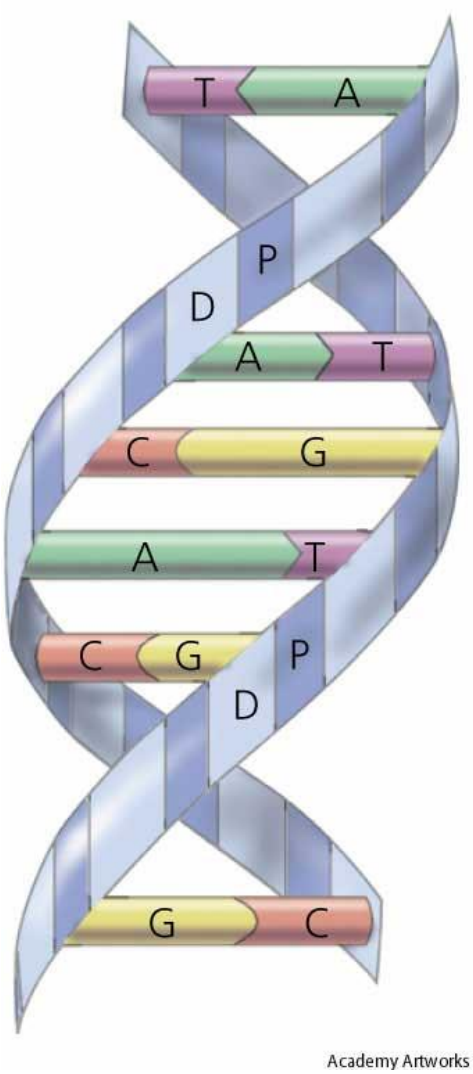
DNA and Genetics

The code of LIFE!



Academy Artworks

Why do related people look like each other?

- Can you guess who my brothers and sisters are?

Heredity

- Why do related people look like each other?
- Why are they different? **DNA- Genetic variation!**


DNA

•Humans share **50%** of their DNA with bananas.

•Cells can contain **6-9** feet of DNA. If all the DNA in your body was put end to end, it would reach to the sun and back over **600** times.

•DNA in all humans is **99.9** percent identical. It is about one tenth of one percent that makes us all unique, or about 3 million nucleotides difference.

•In an average meal, you eat approximately **55,000,000** cells or between **63,000 to 93,000** miles of DNA.

•It would take a person typing 60 words per minute, eight hours a day, around **50** years to type the human genome.

Students WILL...

1. Name the four bases in DNA and describe the structure of DNA using the following terms: Nucleotide (sugar, phosphate, base), Complementary base pairing, Double Helix, and Hydrogen bonding

2. Describe DNA replication with reference to three basic steps: “Unzipping”, Complementary base pairing, and Joining of adjacent nucleotides.

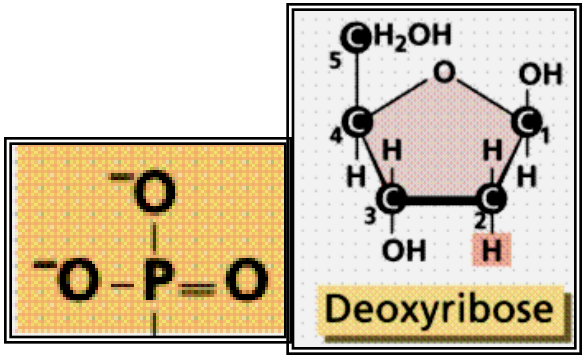
3. Compare and contrast the general structural composition of DNA and RNA

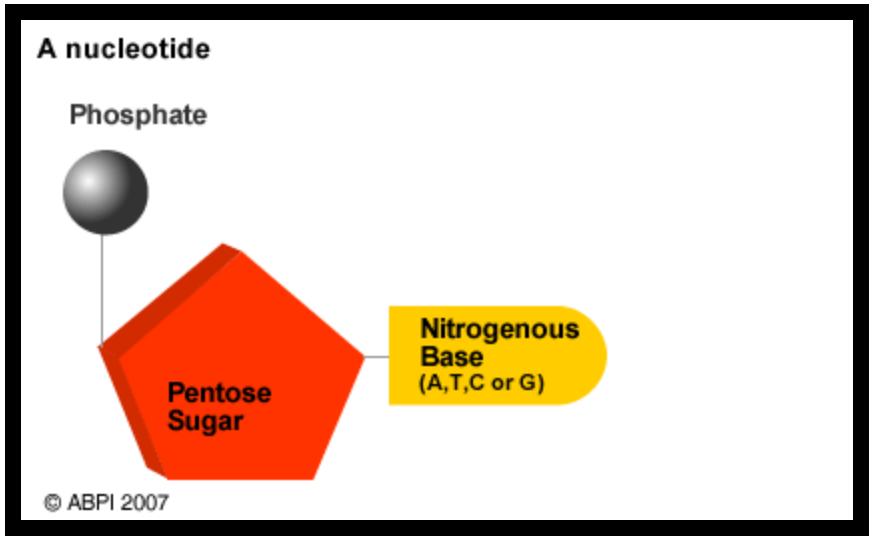
So What Do We Know?

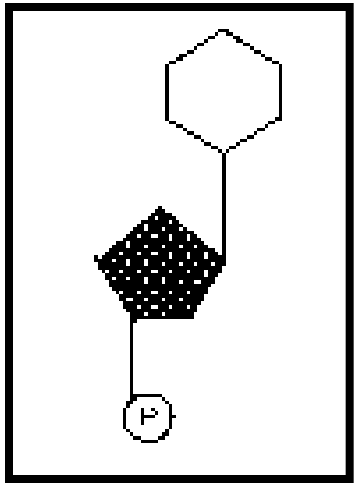
DNA is composed of units called ***NUCLEOTIDES***, which are the monomers (building blocks) of DNA.

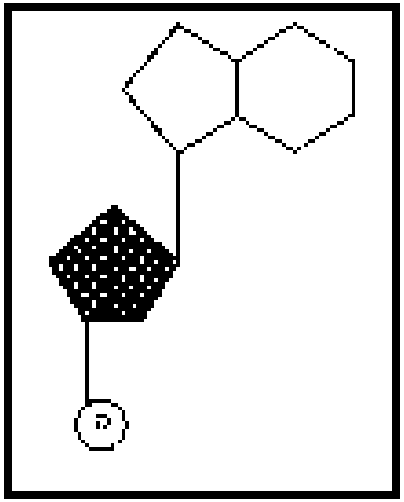
Nucleotides are composed of three sub-molecules:

1. **Pentose Sugar** (deoxyribose)
2. **Phosphate**
3. **Nitrogen Base** (purine or pyrimidine)









So What Do We Know?

DNA is composed of two **complimentary** strands of nucleotides joined by **hydrogen bonds:**

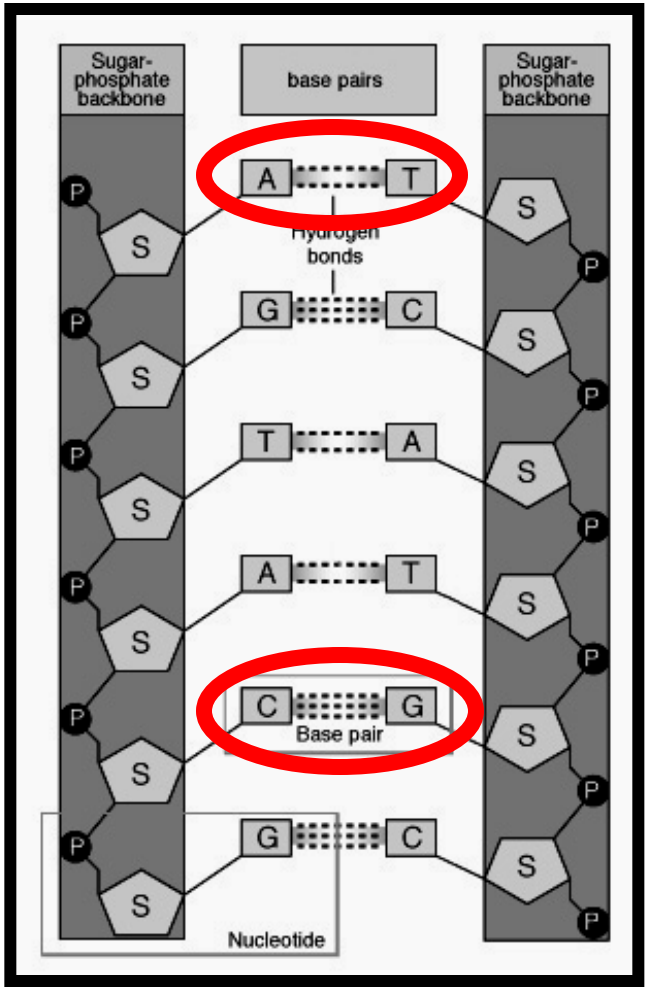
Adenine with **Thymine** **(A-T or T-A)**

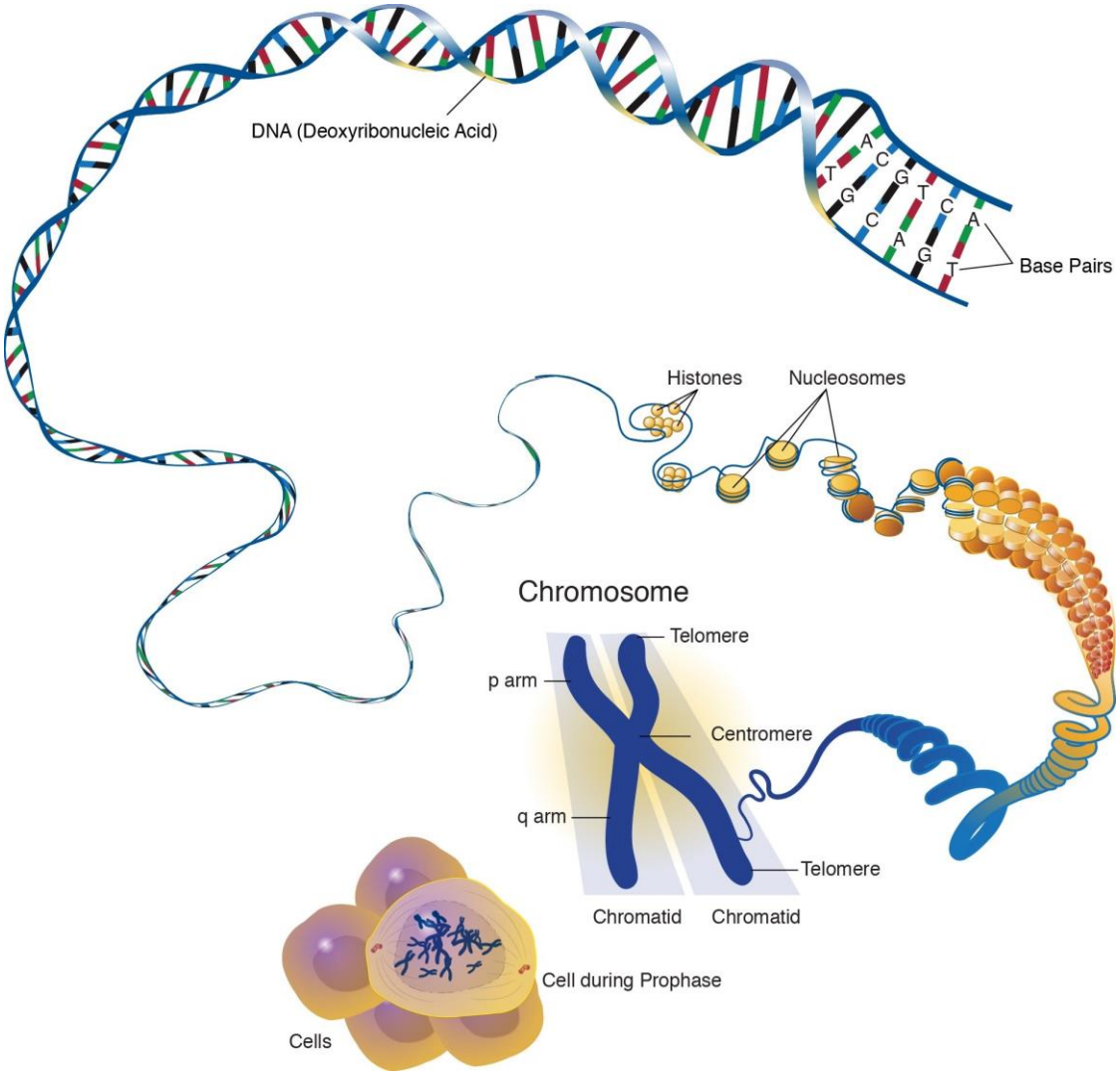
They join with ***2*** *hydrogen bonds*

Cytosine with **Guanine** **(C-G or G-C)**

*They join with **3** hydrogen bonds*

DNA twists into a **double helix**

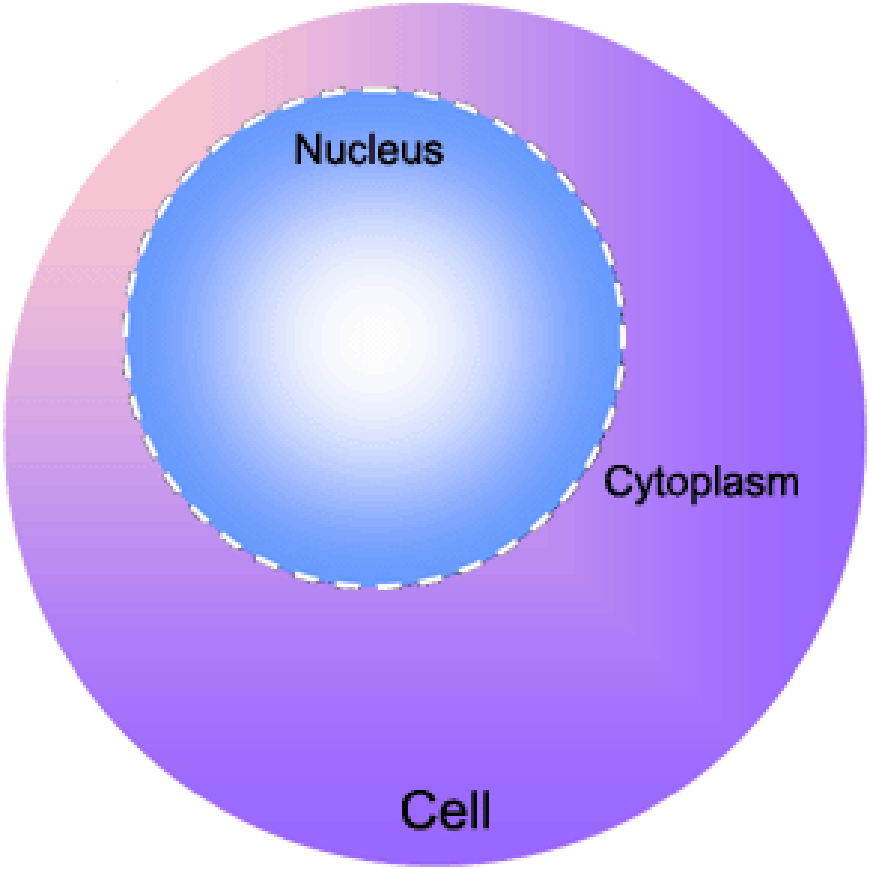




http://learn.genetics.utah.edu/content/molecules/dna/

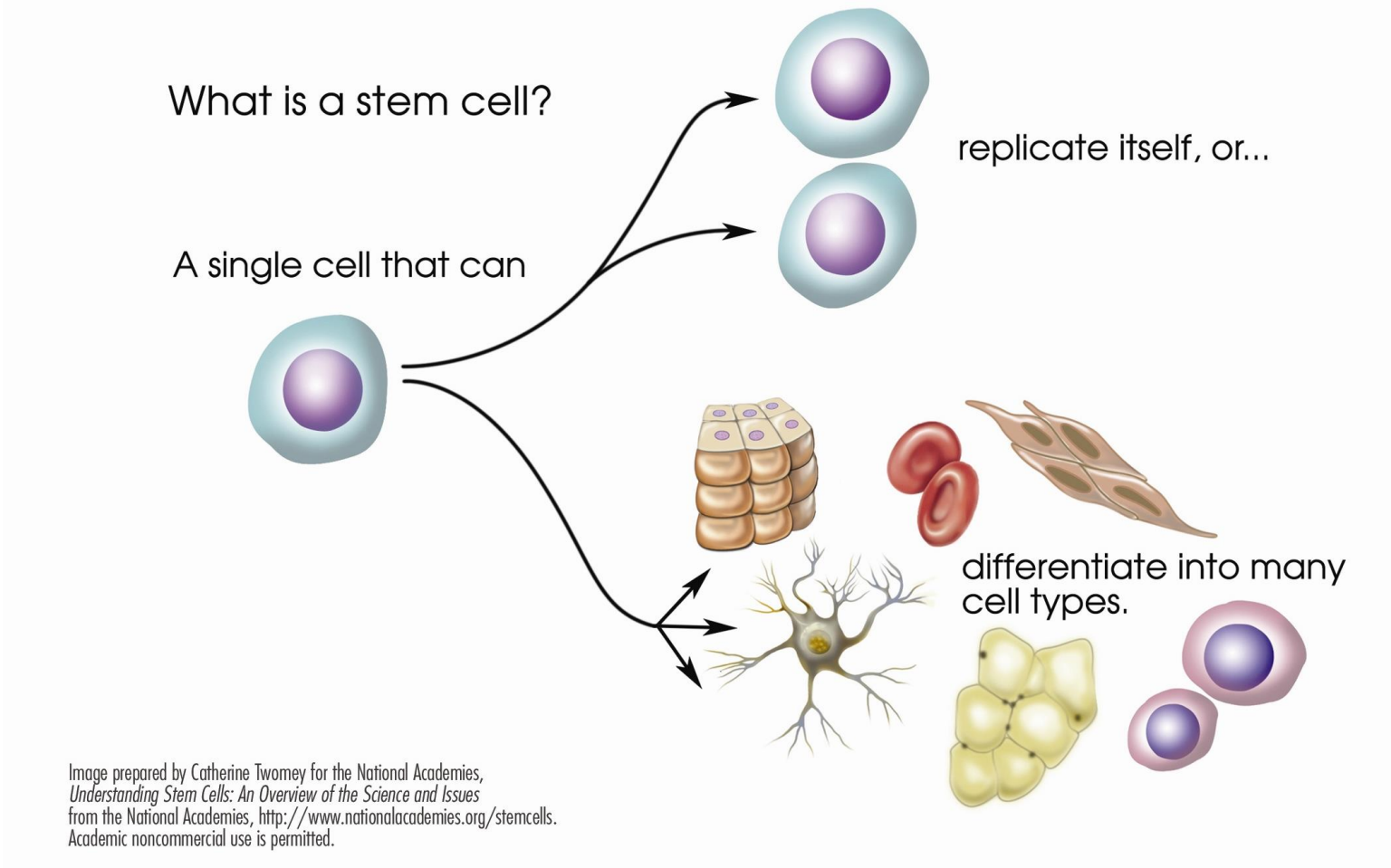
Functions of DNA

1. DNA **directs the** machinery of a **cell to make specific proteins**, and, therefore, DNA indirectly controls all of the functioning of all living things.



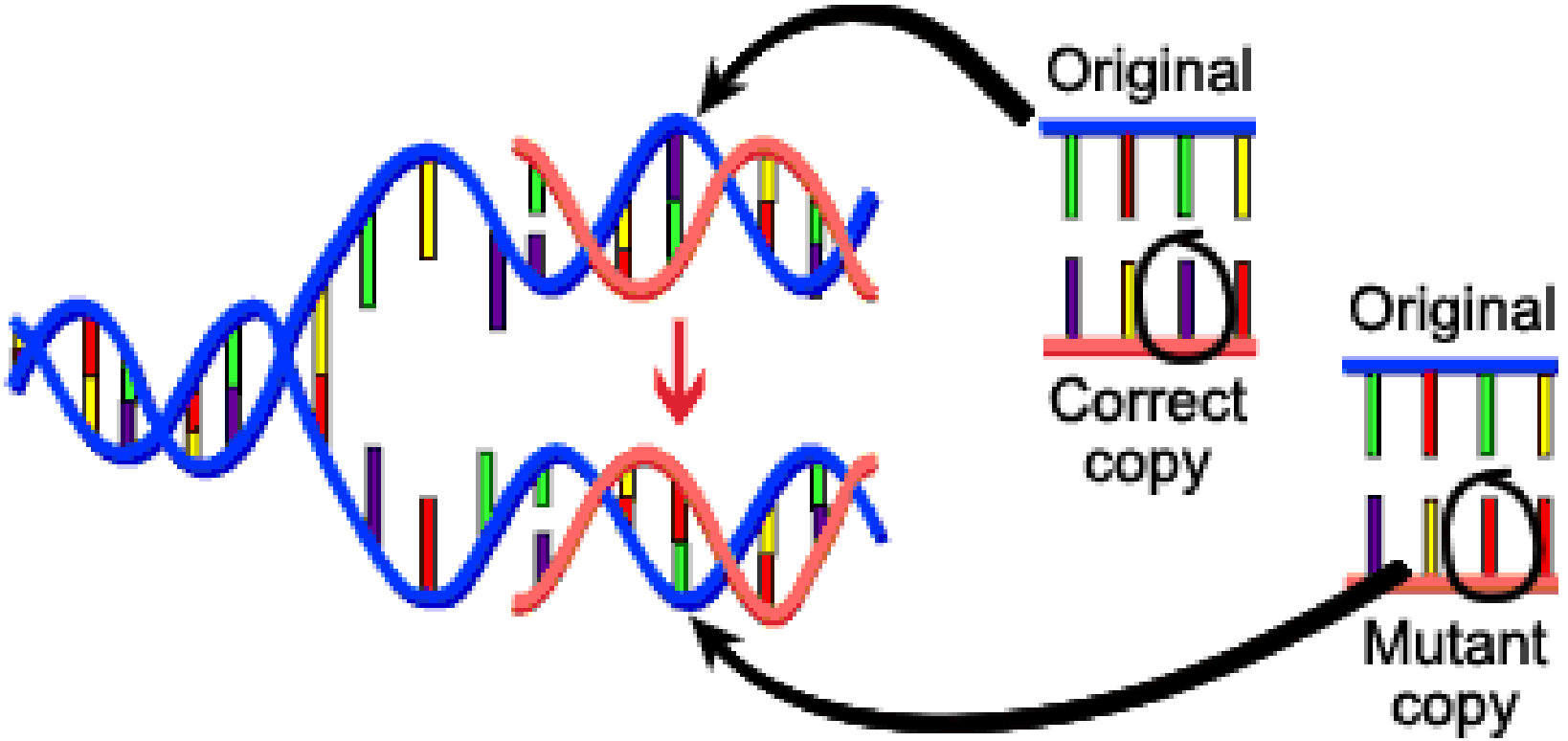
Functions of DNA

2. DNA **stores the hereditary information** of an individual



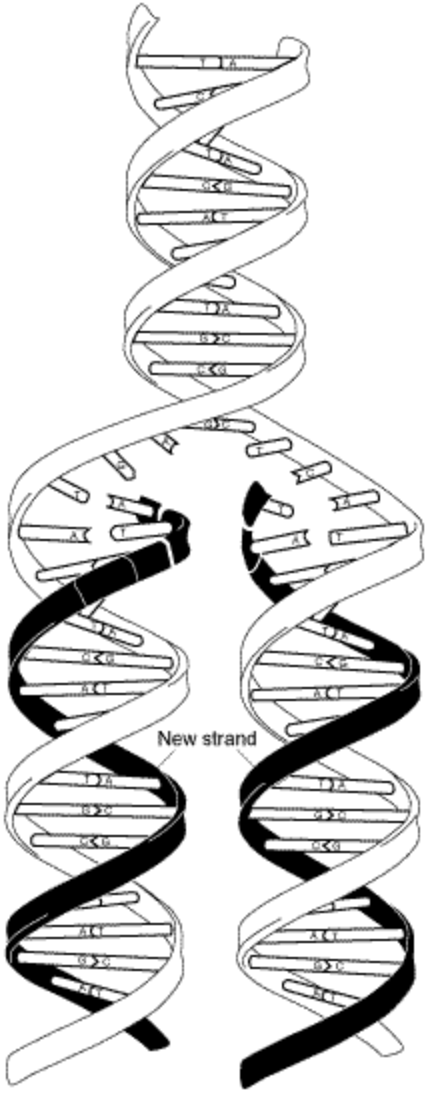
Functions of DNA

3. DNA **has the ability to mutate** (change). This allows for new characteristics and abilities to appear which may help an individual to survive and reproduce (**EVOLUTION**).



Functions of DNA

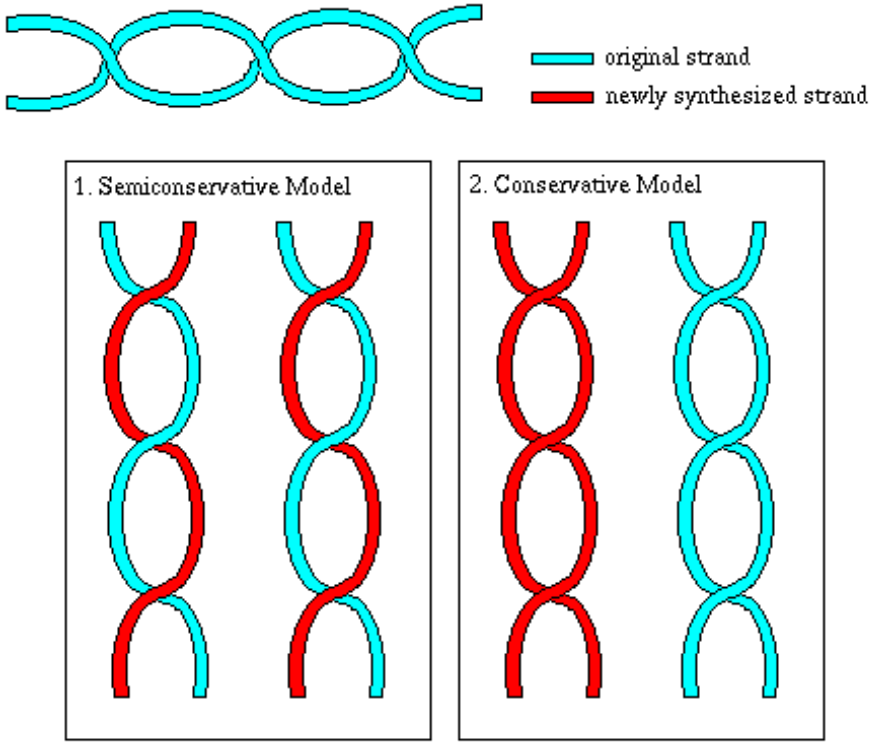
4. Self replication: DNA has the ability to **make copies of itself**



DNA REPLICATION

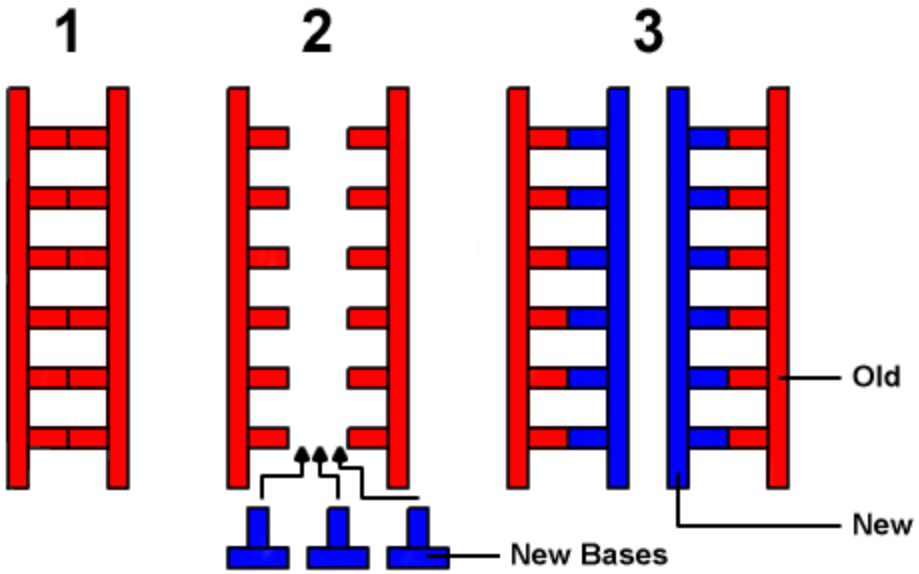
1. DNA replication is called '**semi-conservative**'.

2. Semi-conservative replication is the process in which the **original strands** of DNA **remain intact** and act as **templates** for the synthesis of duplicate strands of DNA.



DNA REPLICATION

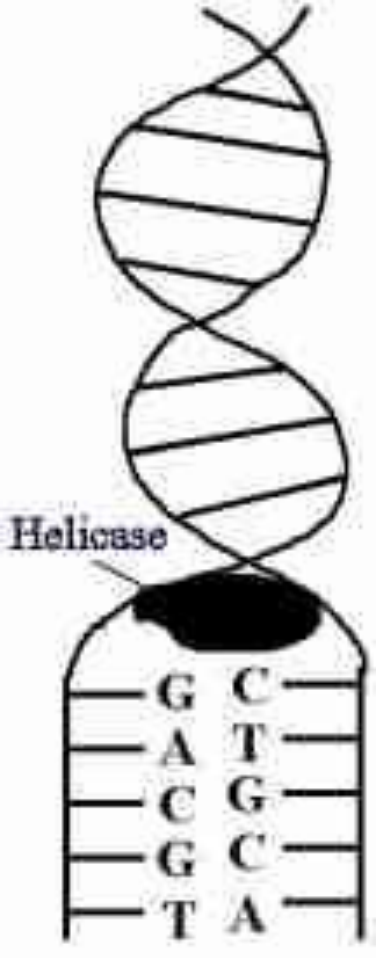
3. One copy of a DNA molecule will split apart to make **two** complete copies of itself. Each new DNA molecule is made up of **half of the old** molecule and **half of a new** molecule.

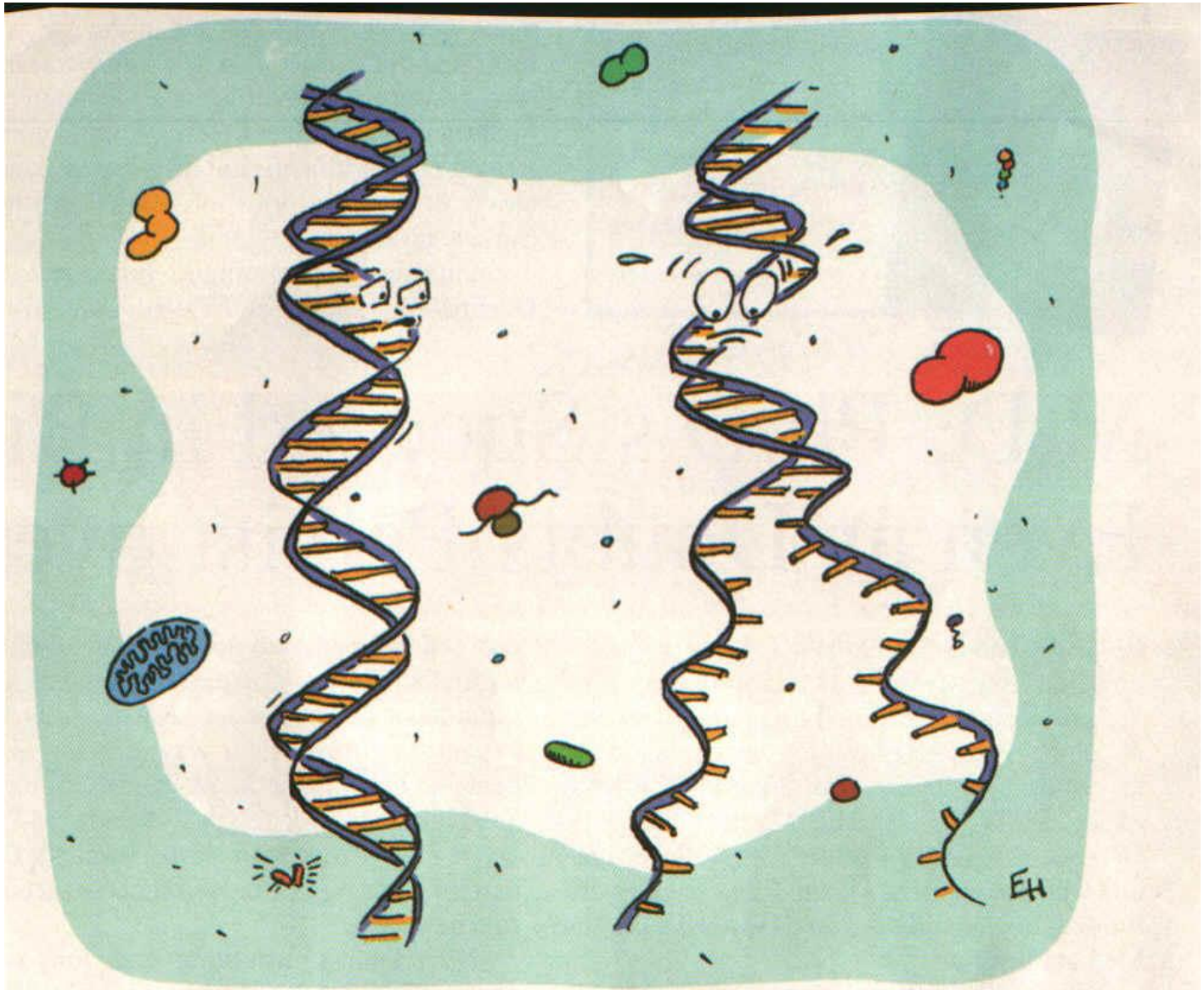


ANIMATION:
http://www.lewport.wnyric.org/jwanamaker/animations/DNA%20Replication%20-%20long%20.html

STEPS TO DNA REPLICATION

1. **UNZIPPING**: The DNA molecule 'Unzips' as the **hydrogen bonds** between the base pairs are **broken**. The enzyme **HELICASE** causes this unzipping to occur.

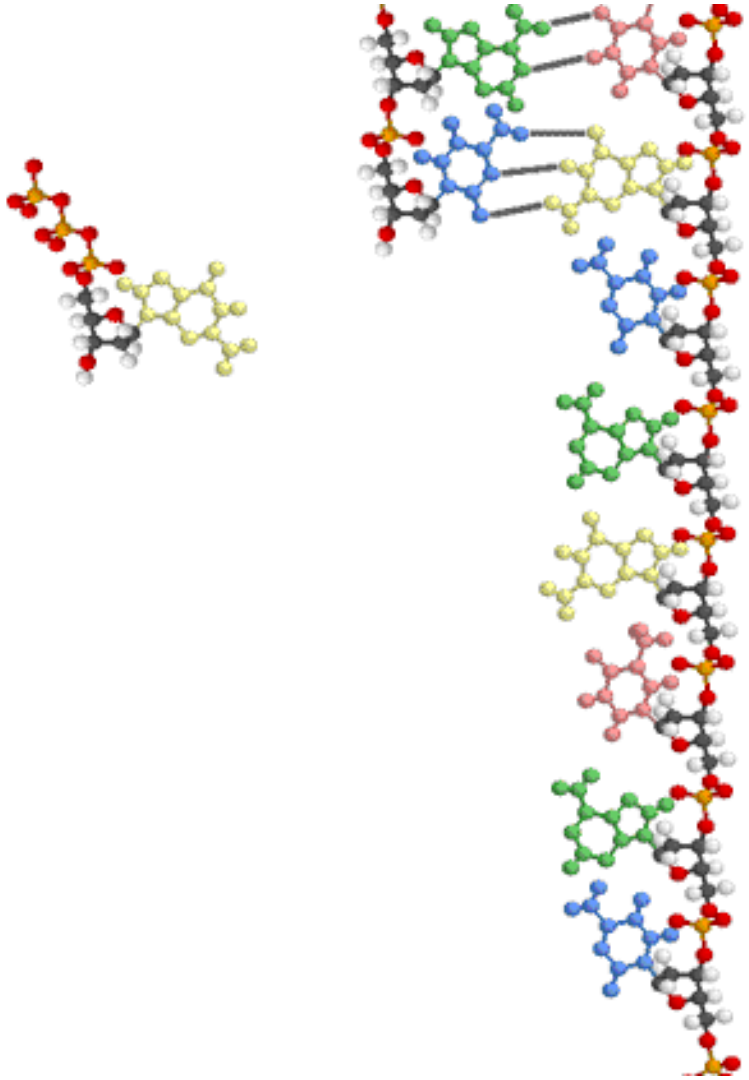




" Psst, Bob...you're unzipped"

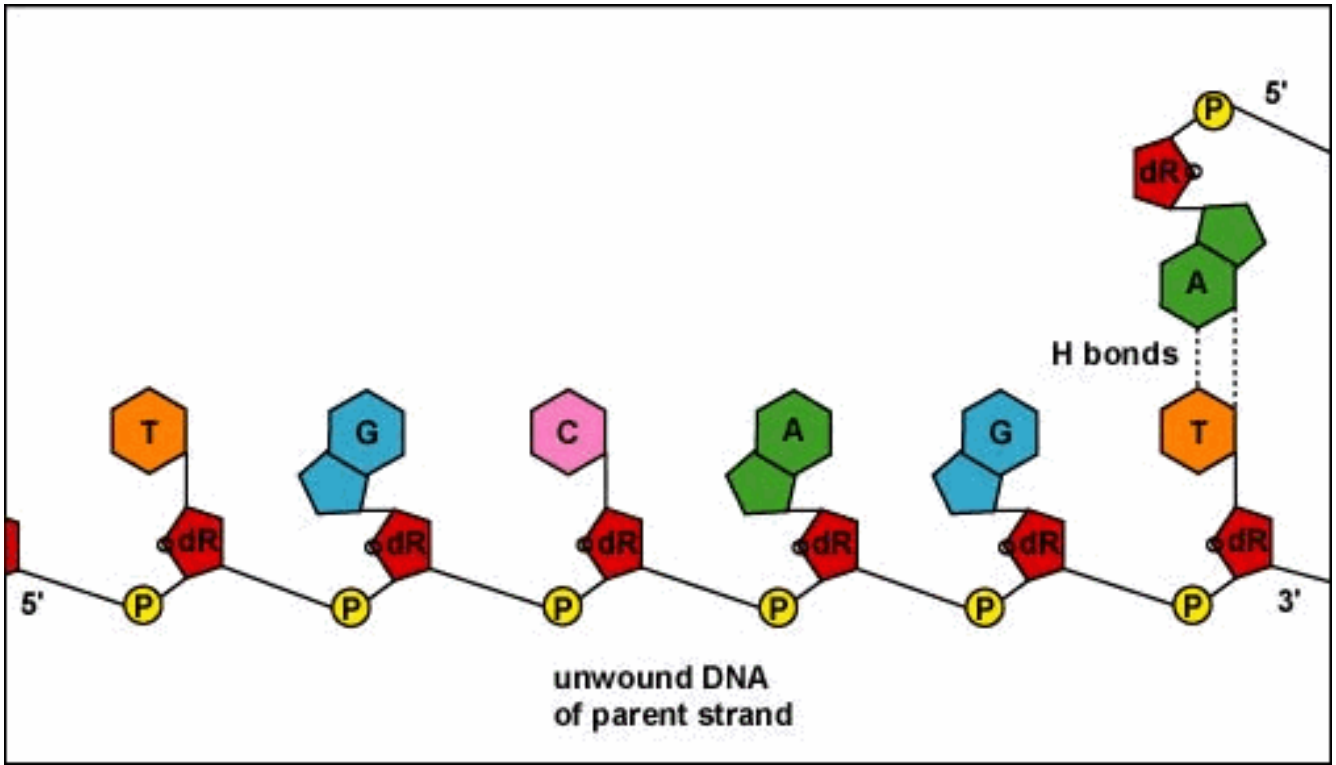
STEPS TO DNA REPLICATION

2. COMPLEMENTARY BASE PAIRING: Complementary **nucleotides move into position** to bond with the complementary bases on the DNA chain.



STEPS TO DNA REPLICATION

3. FORM NEW SUGAR PHOSPHATE BACKBONE: The nucleotides join as the sugars and phosphates bond to form a new backbone. This process occurs due to the enzyme **DNA POLYMERASE.**



STEPS TO DNA REPLICATION

4. This process continues along the primary chain until we have **2 IDENTICAL STRANDS** of DNA molecules (assuming there have been no errors made).