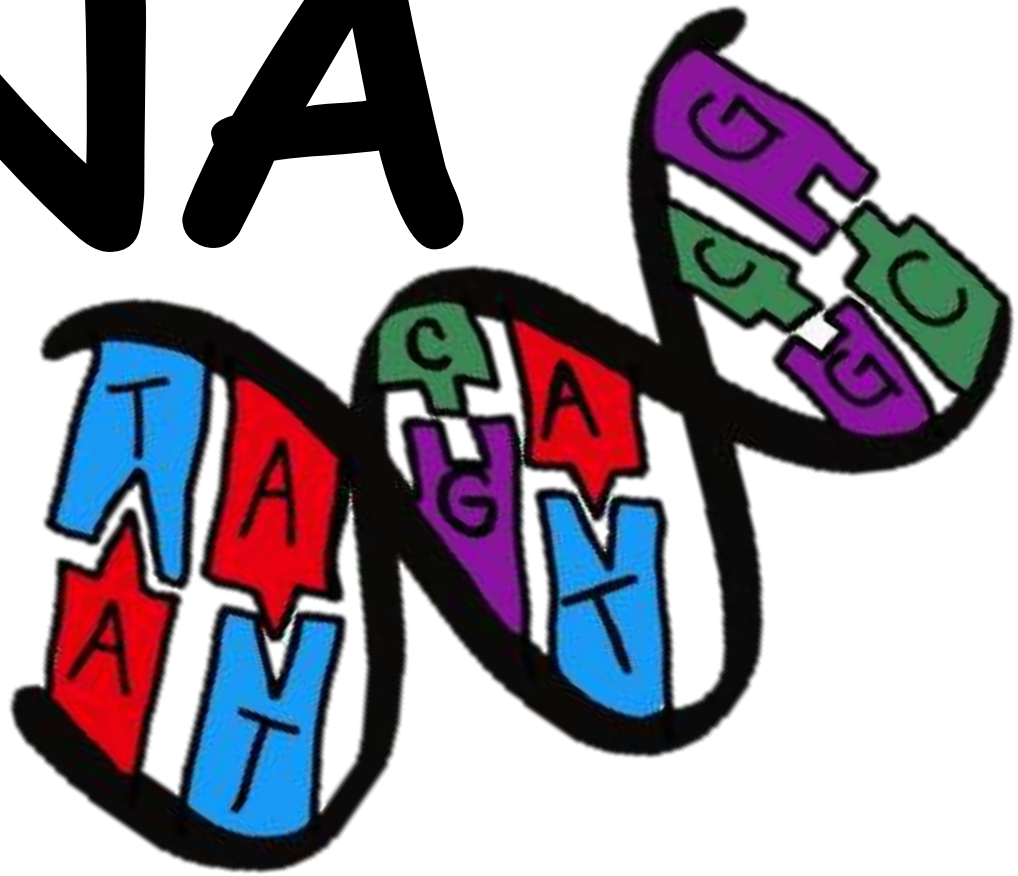
DNA



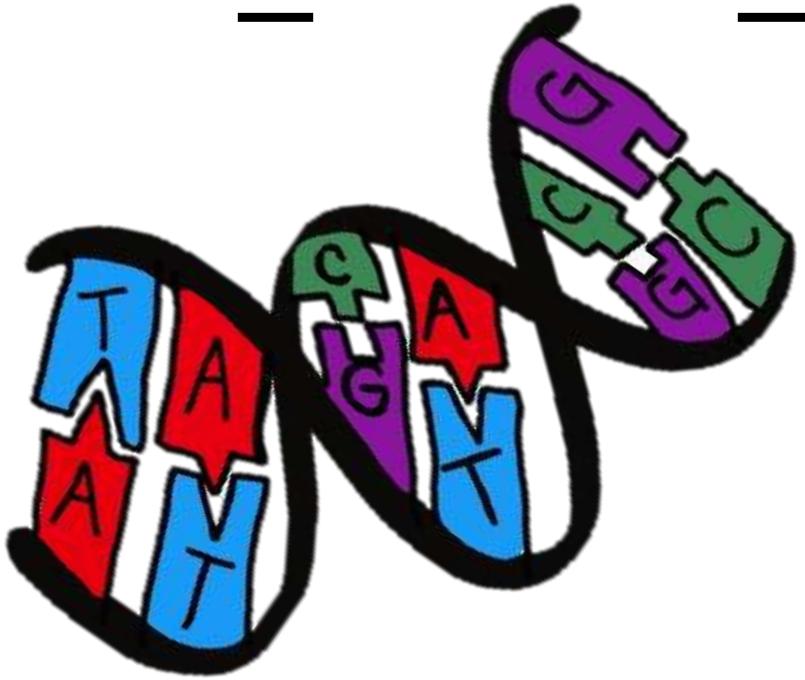
HS-LS1-1 HS.Structure & Function

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. *(**Assessment Boundary**: Assessment does not include identification of specific cell or tissue types, whole body systems, specific proteins structure and functions, or the biochemistry of protein synthesis)*

What is DNA?

- DNA stands for

  Deoxyribonucleic Acid (DNA)



What is it important?

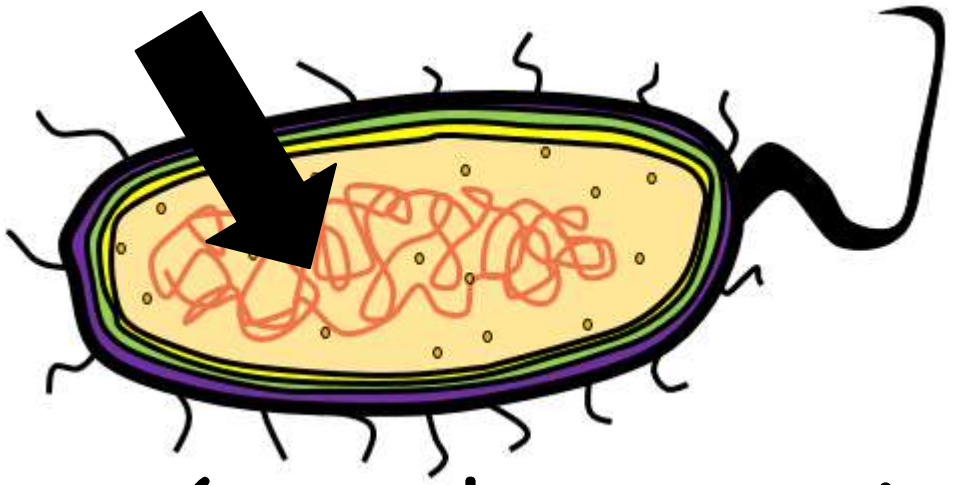
- it contains the **blueprint of life**
- it contains all of an organism's genetic code, thus it has the instructions for making an organism and its proteins.

Proteins

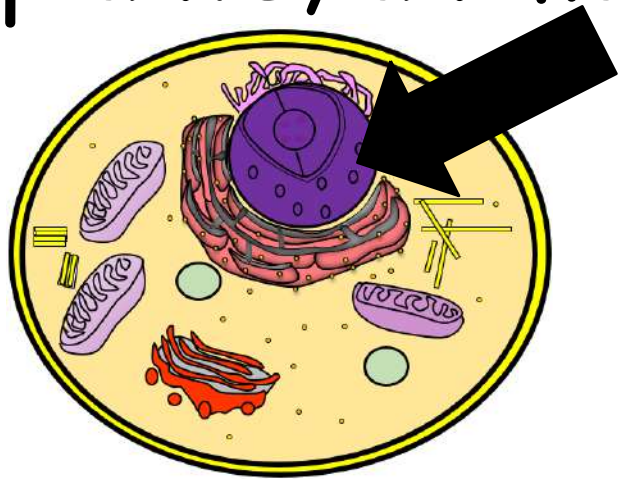
- Proteins are very important and each protein has a specific role
  - ✓some control the rate of reactions
  - ✓help fight diseases
  - ✓regulate cell processes
  - ✓help form bones and muscles
  - ✓transport substances in and out of cells

Where can DNA be found in cells?

- prokaryotes (ex: bacteria) –floating around in cell

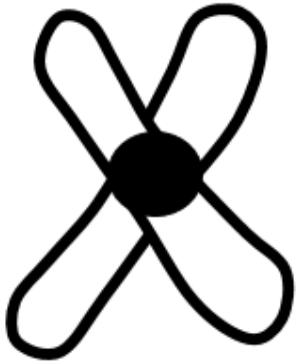


eukaryotes (ex: plants, animals) –inside nucleus



Where is it stored?

- in **chromosomes**, which contain all the <u>genetic material</u>

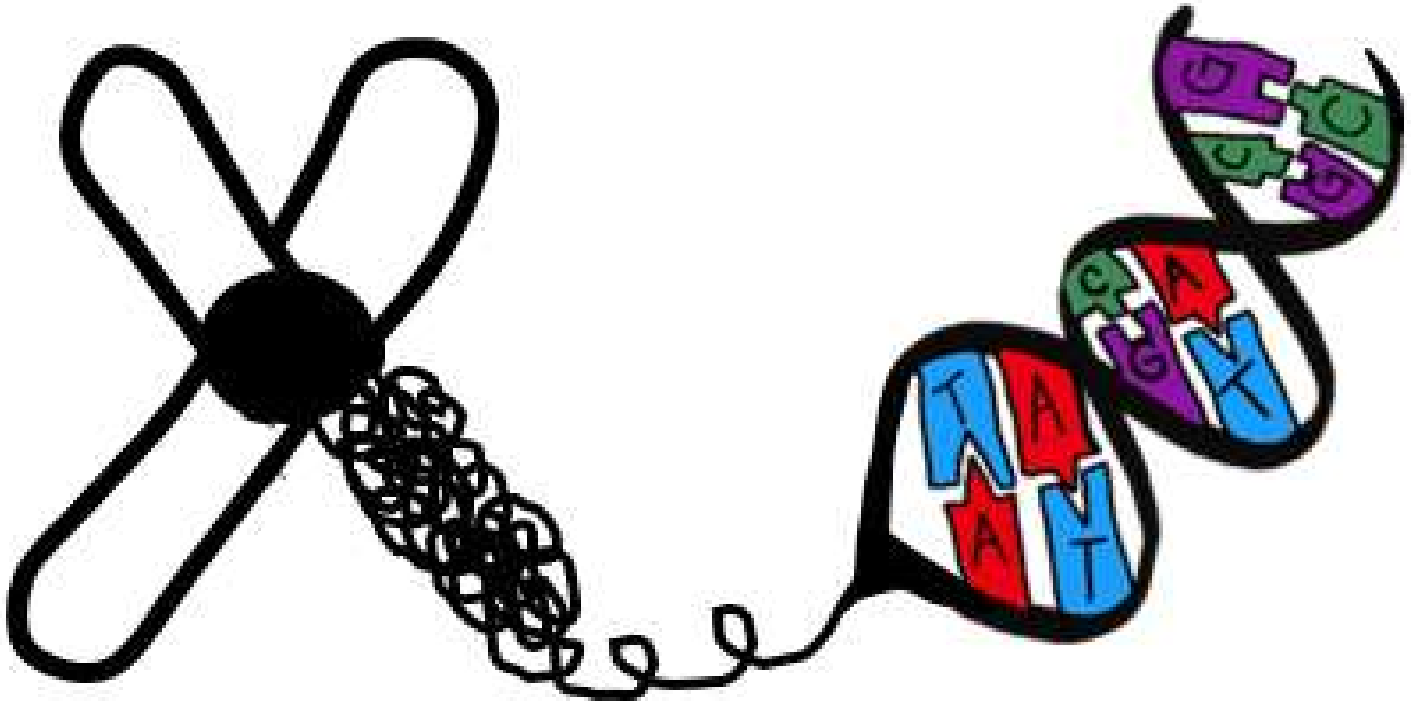


- **gene** – a segment of a chromosome that codes for a protein

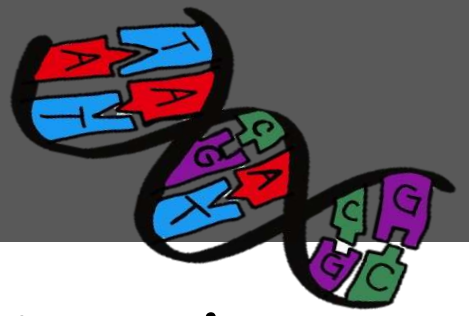
(in other words it's a stretch of DNA), which in turn codes for a trait (like hair & eye color)

Understand:

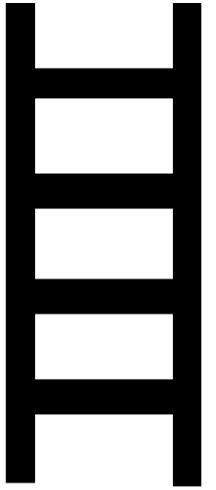
- if you unraveled a chromosome, you would see the structure of DNA



Structure of DNA



- Watson and Crick discovered DNA shape was that of a **double helix** (looks like a twisted ladder) after looking at an x-ray diffraction image that was created by Rosalind Franklin
- it has **two** strands
- it is made up of repeating subunits called **nucleotides**



Nucleotide

-consist of 3 components

1.) **Sugar** = Deoxyribose

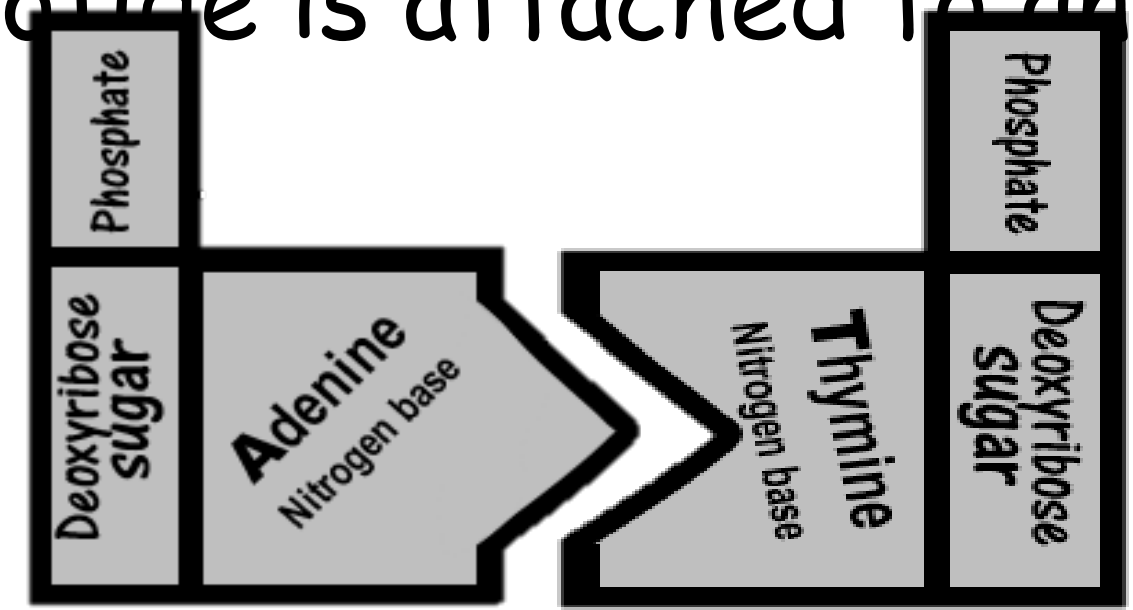
2.) **Phosphate**

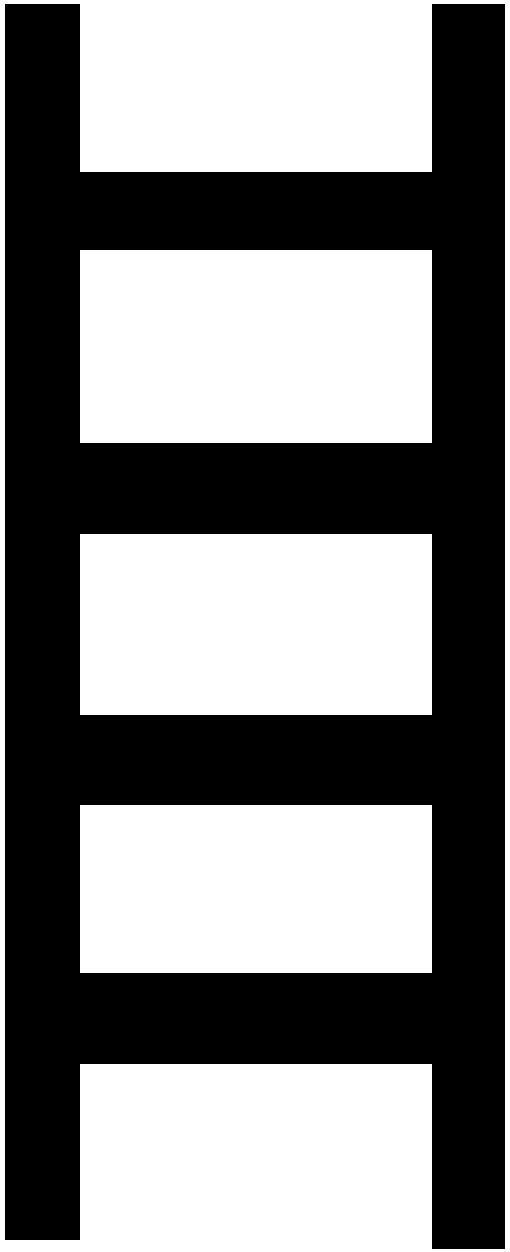
3.) **Nitrogen base**

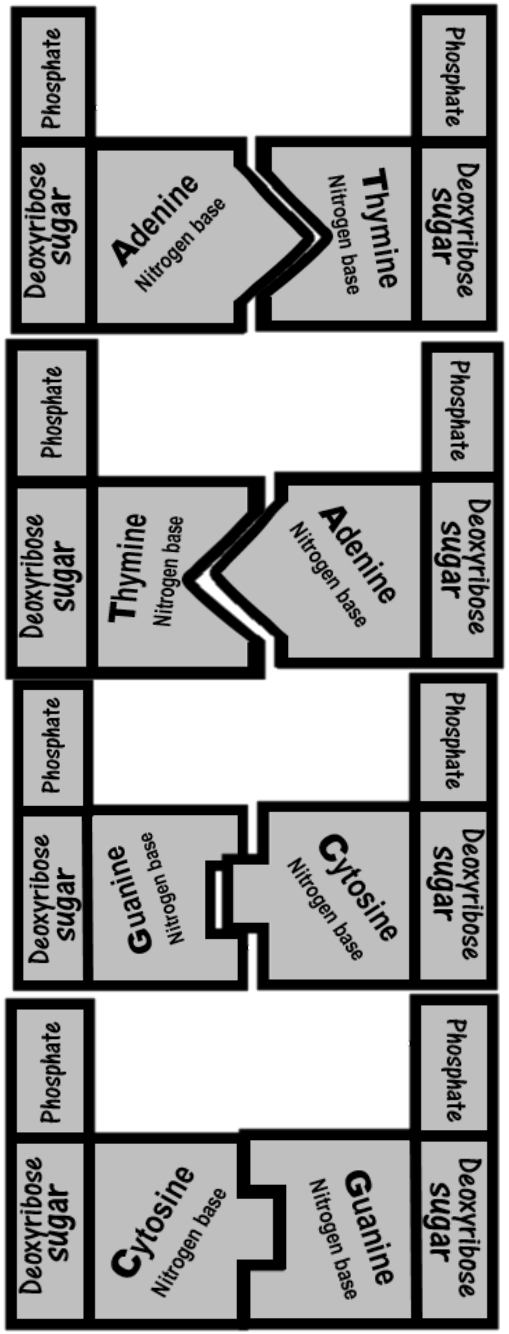
- Adenine (A)
- Thymine (T)
- Guanine (G)
- Cytosine (C)

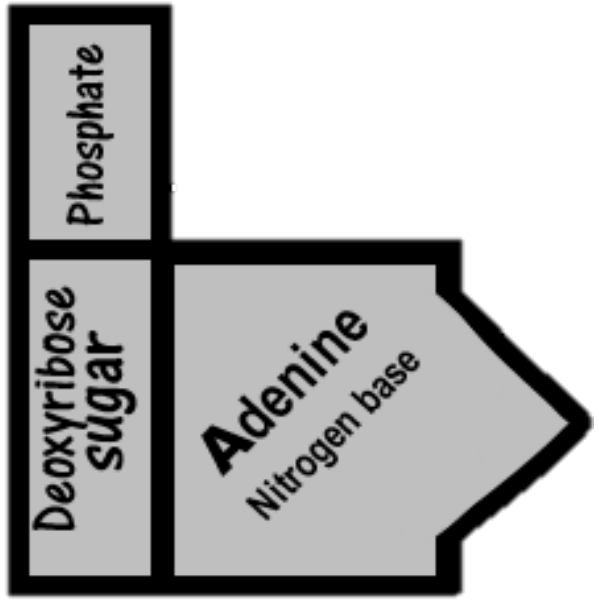
Nucleotide

- DNA's backbone (or the sides) are made up of alternating **sugar** and **phosphate**
- **Sugar** is always attached to a **nitrogen base**
- One nucleotide is attached to another







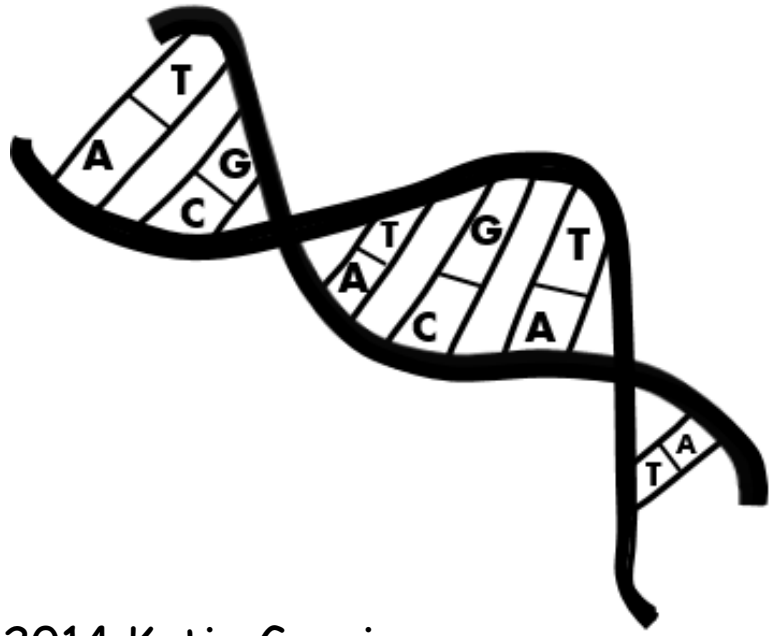


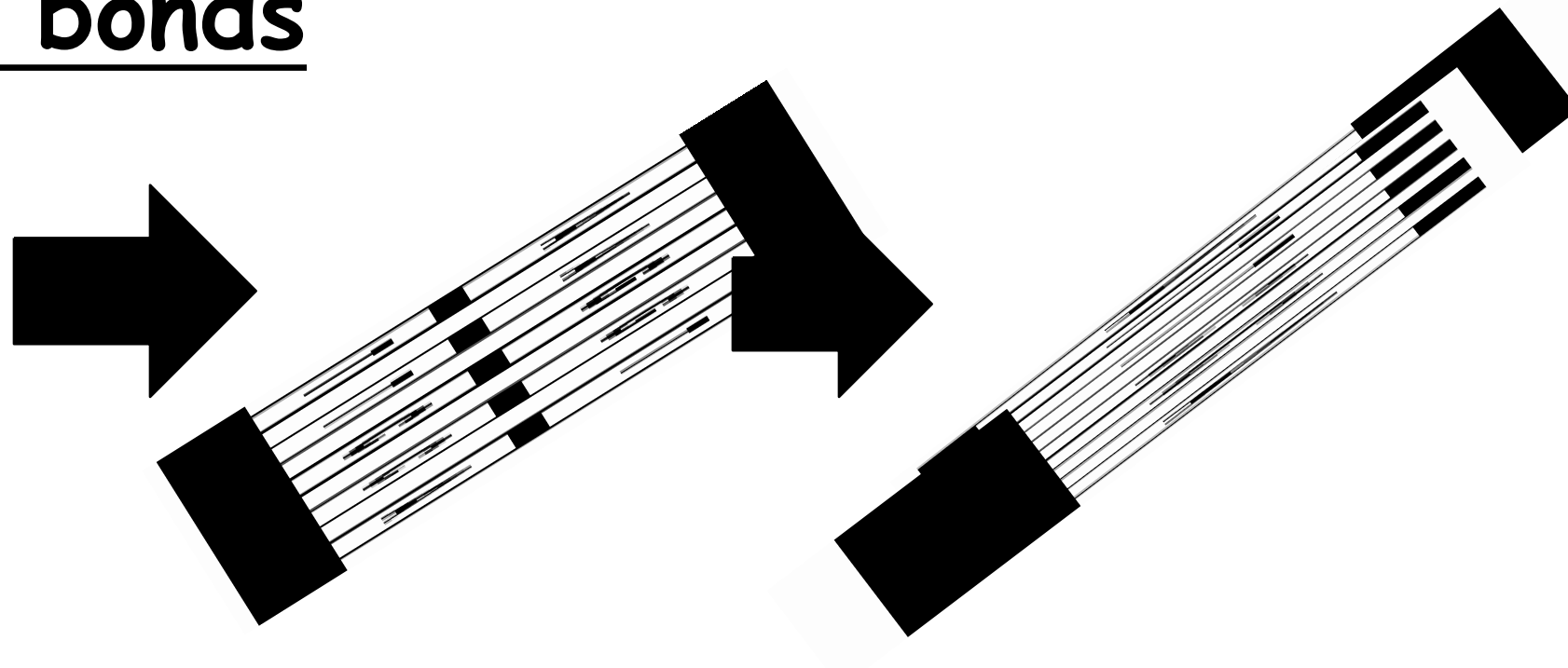
nucleotide – a piece to build a DNA molecule

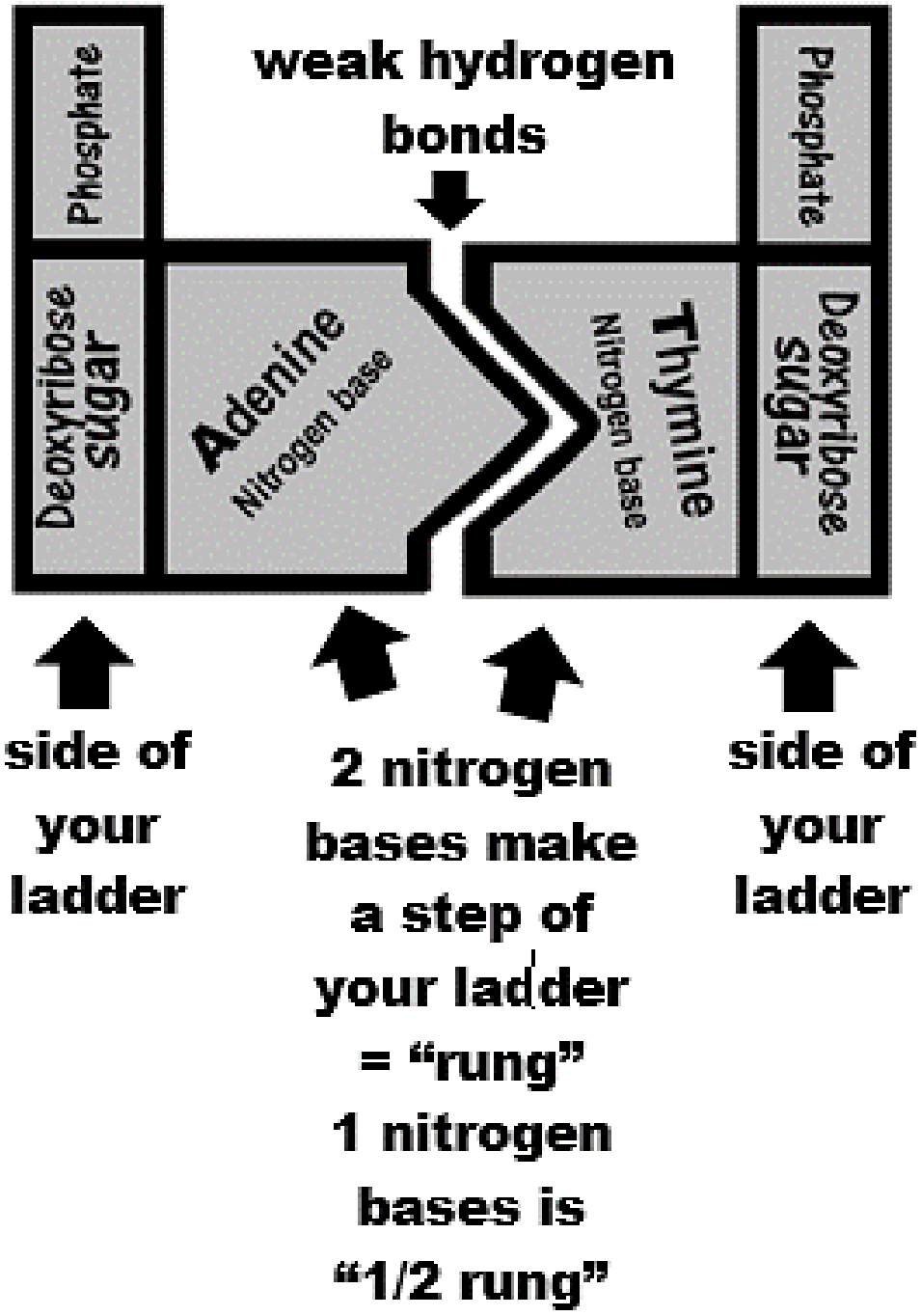
if you have a smartboard, move the nucleotide pieces and show students how it is assembled!

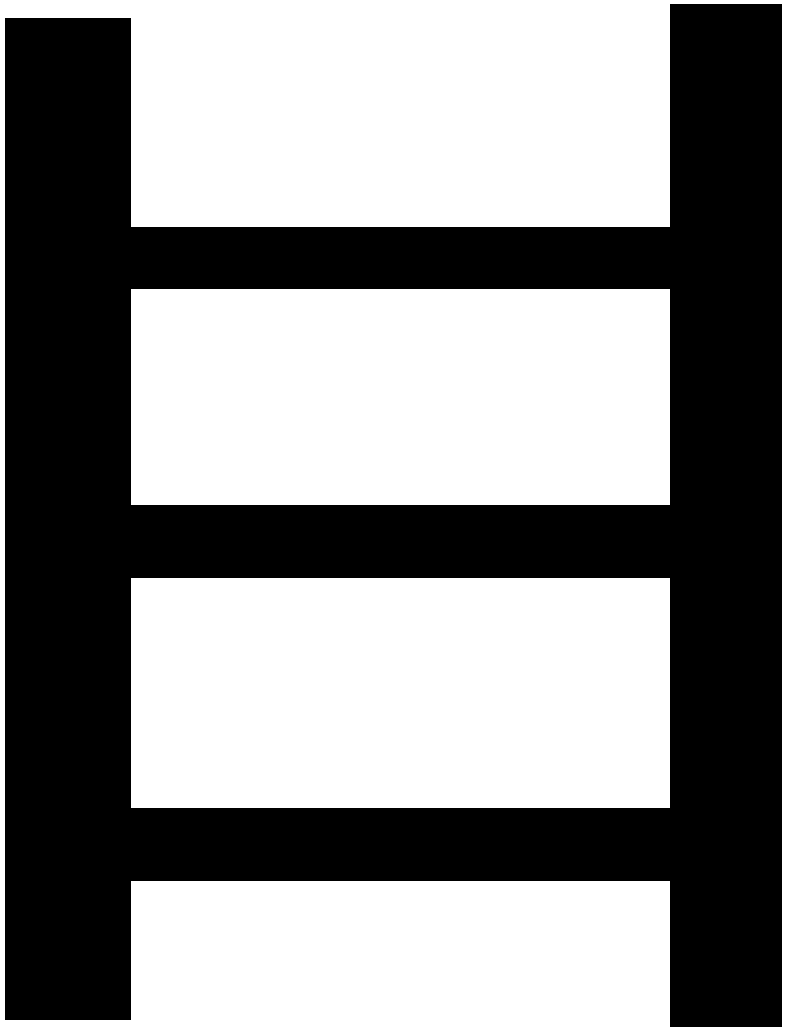
DNA is Double Stranded

- Recall DNA is double stranded
- One strand is bonded to the other strand by **weak hydrogen bonds**



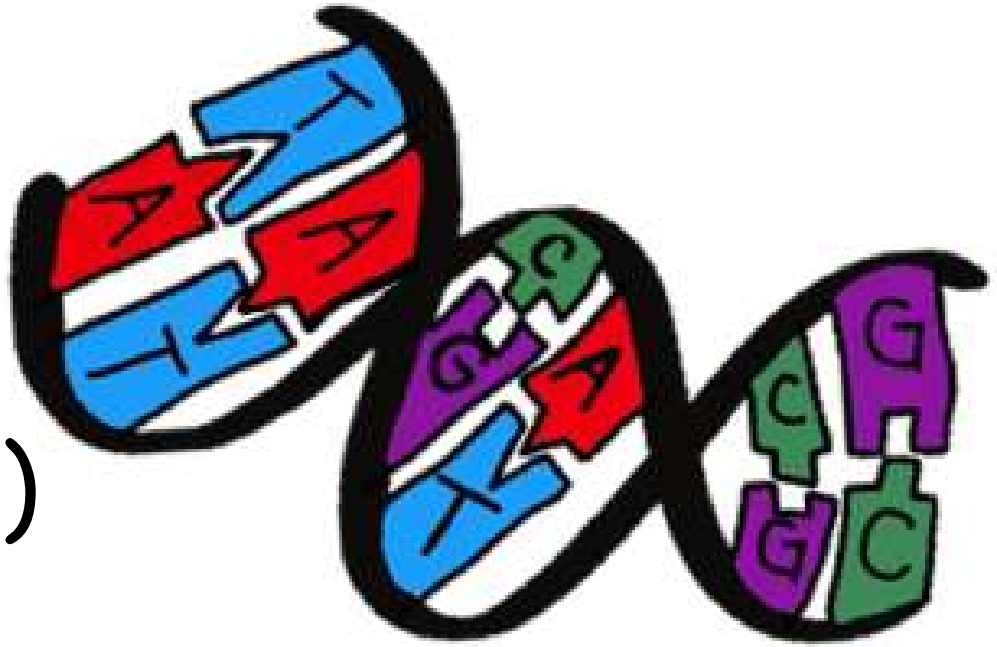






Complementary Base Pairing

- The nitrogen bases of one strand pair with specific bases on the other stand (**complementary base pairing**)



- Adenine (A) always **pairs** with Thymine (T)
- Guanine (G) always **pairs** with Cytosine (C)

Base Arrangement

The way your nitrogen bases are arranged codes for your **traits**

For example

A-G-C-T-A-T might code for **brown** eyes
C-G-T-A-A-G might code for **blue** eyes

This is a simplified explanation of how DNA codes for your traits (note: it's a little more complicated than this but at least you get the idea).

DNA Replication

-DNA making a copy of itself

-Why does DNA need to make a copy of itself?

Well, think of a growing child.

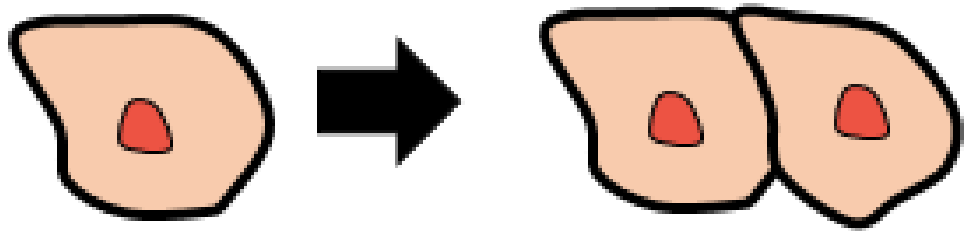
How does the child grow?

New cells have to be made and remember cells contain DNA.

DNA Replication

ALSO when we……

- ✓reproduce (pass on our genetic material to our children)
- ✓injury ourselves (**like** if you cut your arm your body responds by making new cells to repair the wound)



So it is important that DNA replicates. DNA makes a copy of itself right before a cell divides

DNA Replication

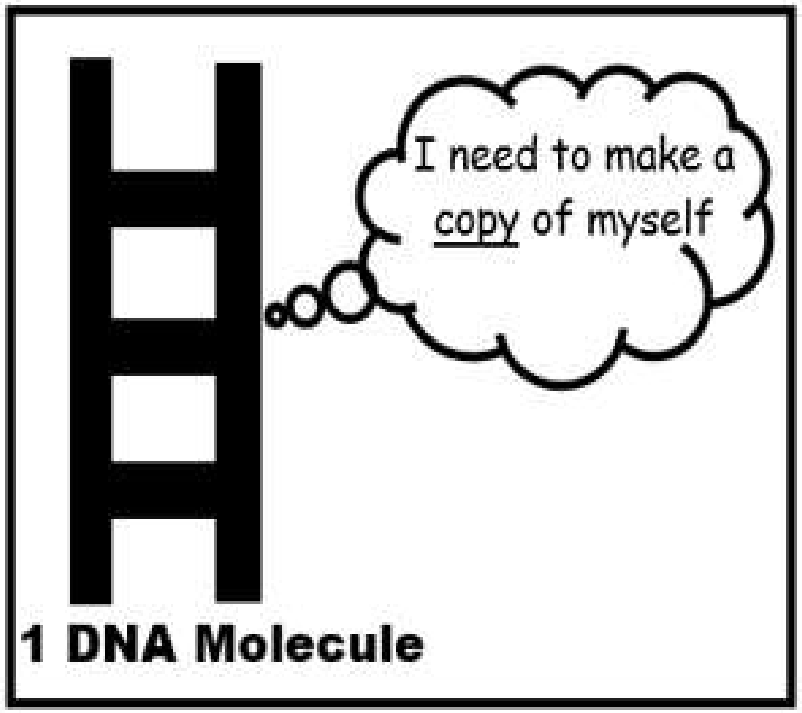
During DNA replication

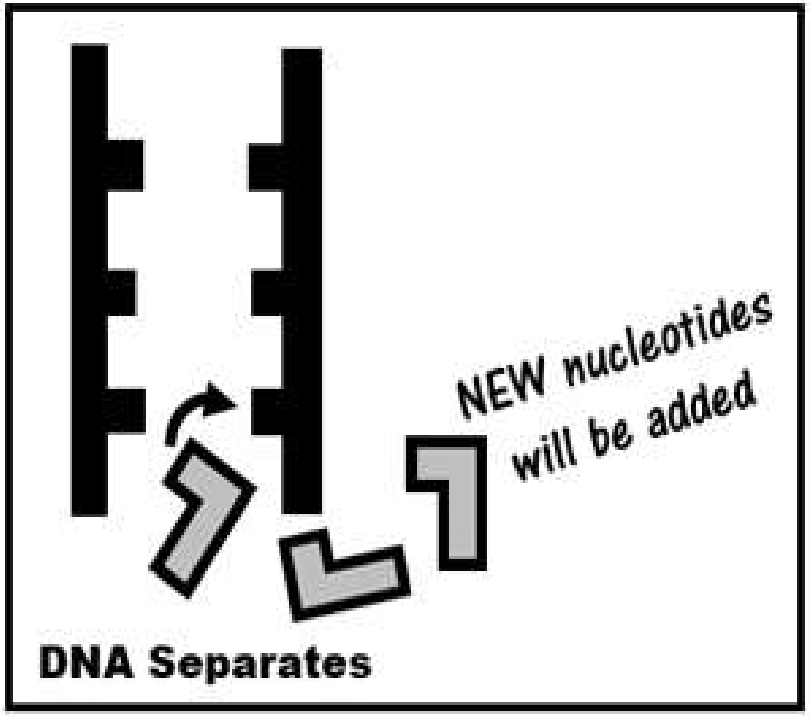
- the DNA molecules separates into two strands
- then produces two new complementary strands following the rules of base pairing
- each strand of the double helix of DNA serves as a **template**, or model, for the strand

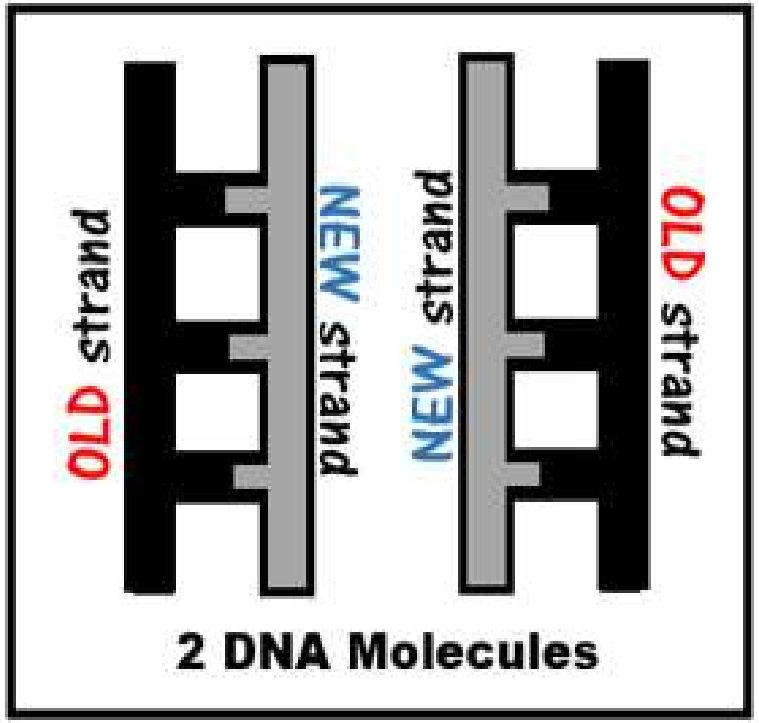
At the end of replication

- each DNA molecule resulting from replication has one **original** strand and one **new** strand
- because of this, DNA is **semi-conservative**

DNA Replication







At the end of replication, each DNA molecule resulting from replication has one original strand and one new strand. Because of this, DNA is **semi-conservative**.