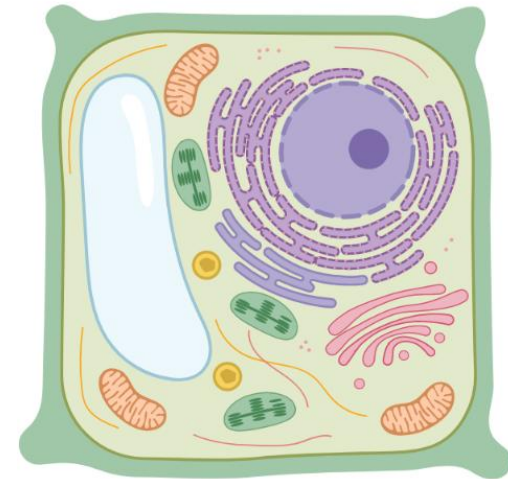
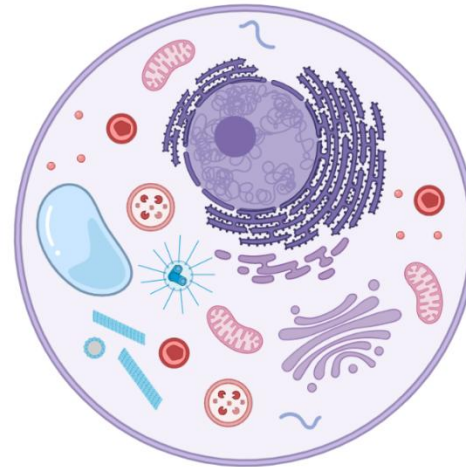
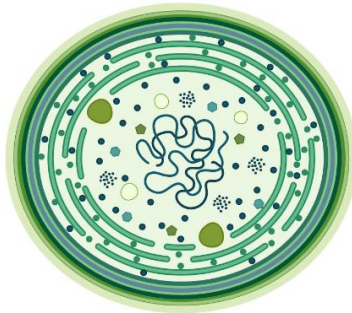




Weill Cornell Medicine

Feil Family Brain & Mind Research Institute

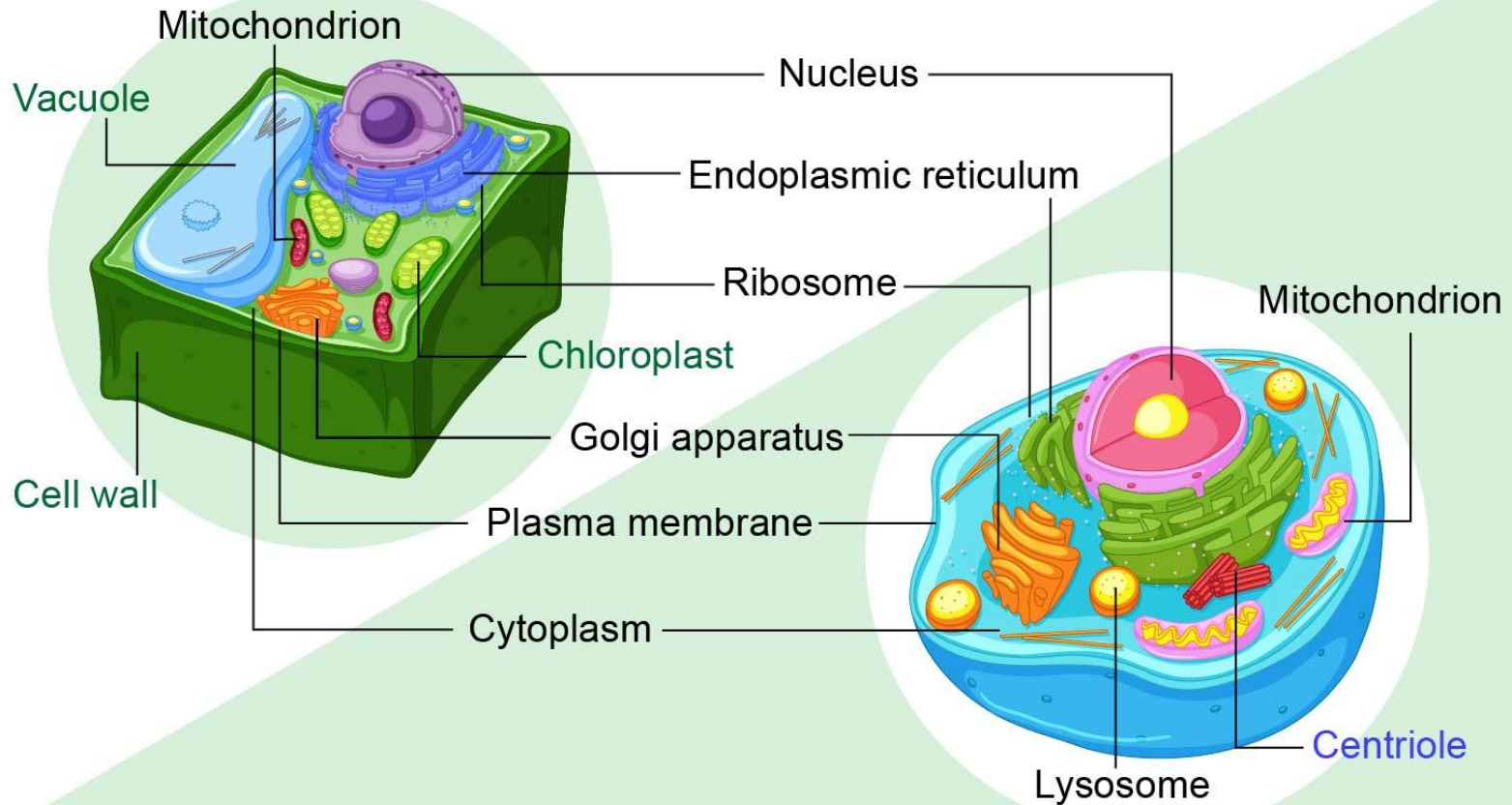
What is inside a cell nucleus?



Dr. Alexander Galkin

Two main types of eukaryotic cell

PLANT CELL



ANIMAL CELL

CELL THEORY

Four Fundamental tenets of cell theory :-

1 - All living things are composed of cells. 

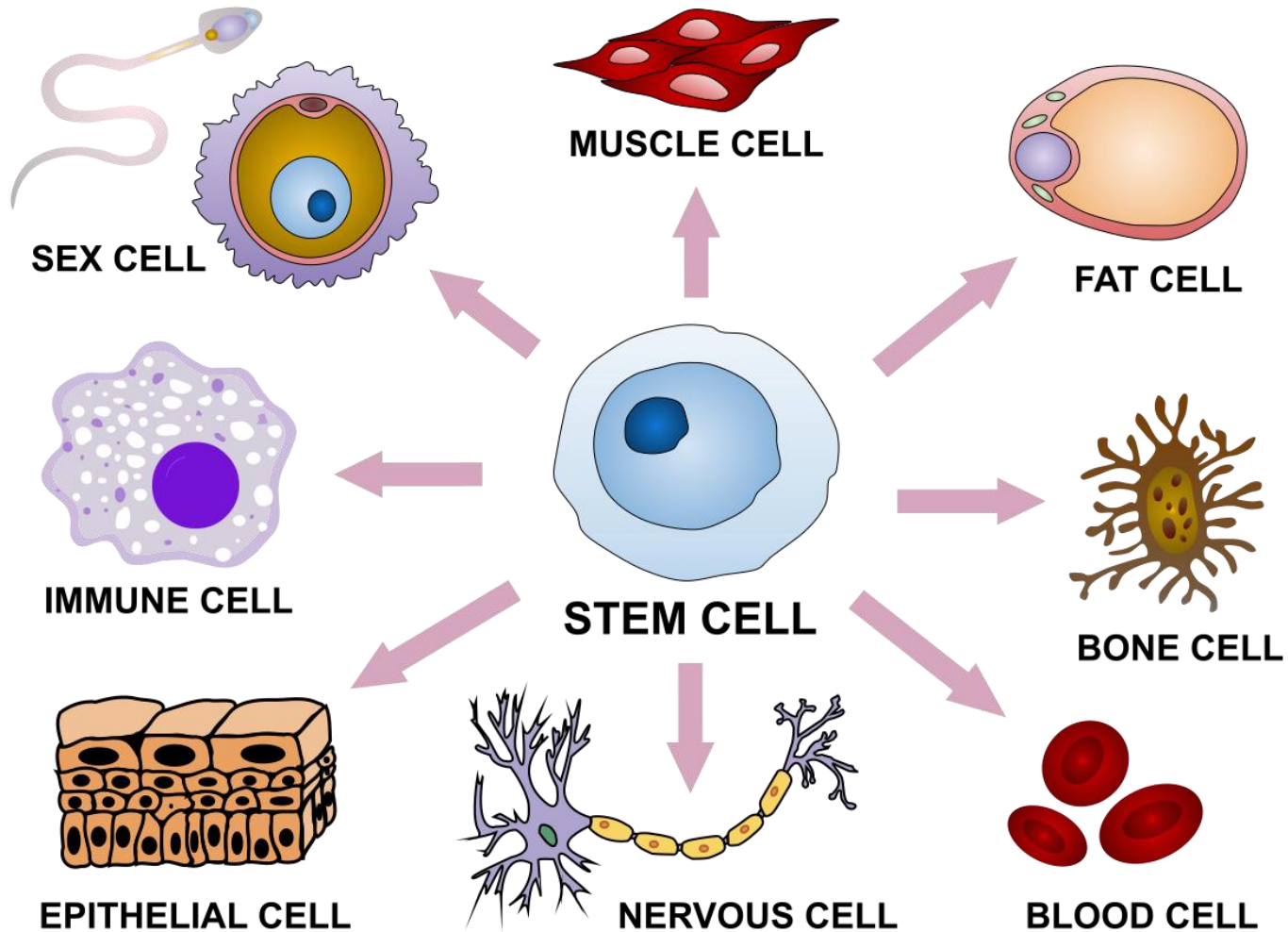
2 - The cell is the basic functional unit of life 

3 - Cells arise only from preexisting cells 

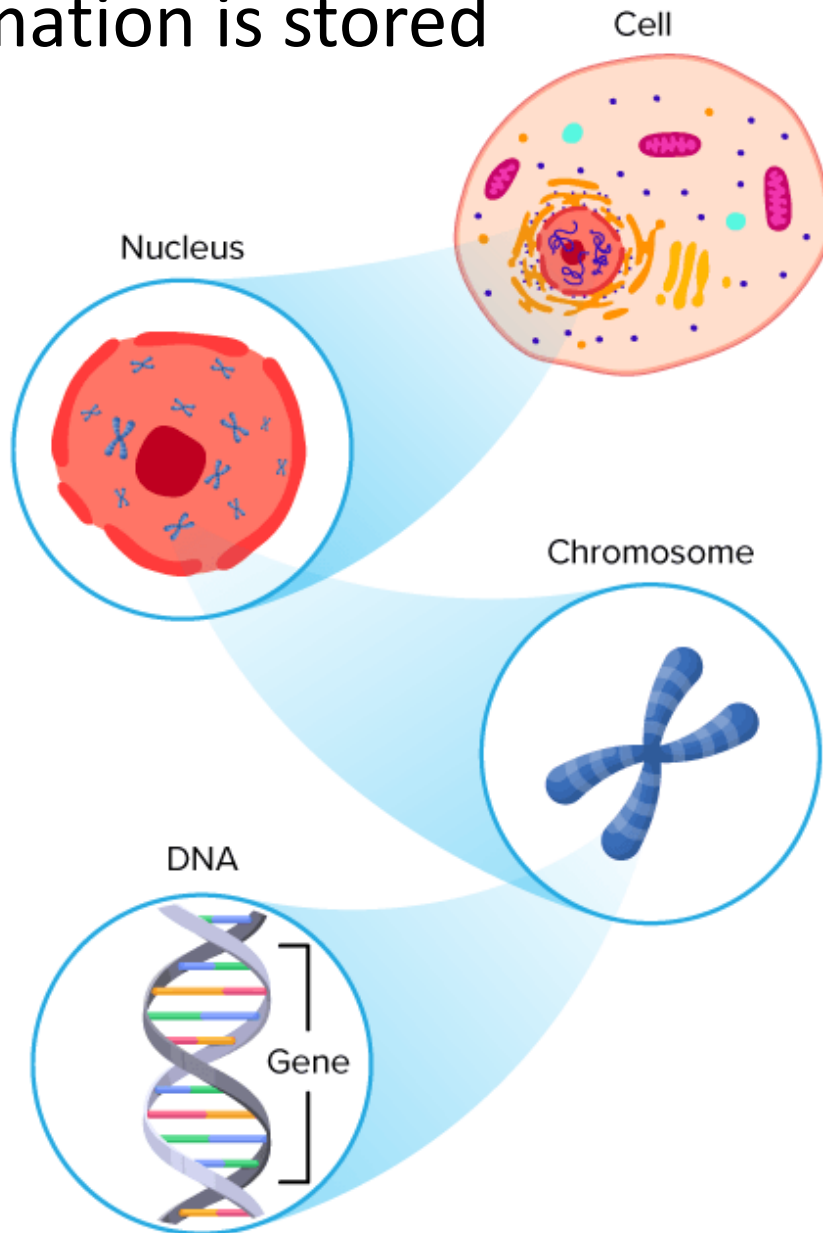
4 - Cells carry genetic info in the form of DNA 

Somehow information about what to do should be transferred from cell to cell

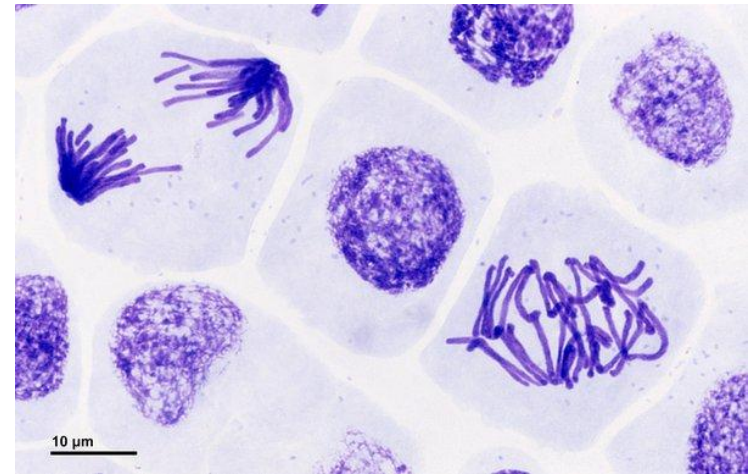
Cell specializations and stem cell



Nucleus – where information is stored



Chromosomes



Nucleus is very small and DNA molecule is very long (but thin)

MRC Presents
Real Mitosis Under Microscopes



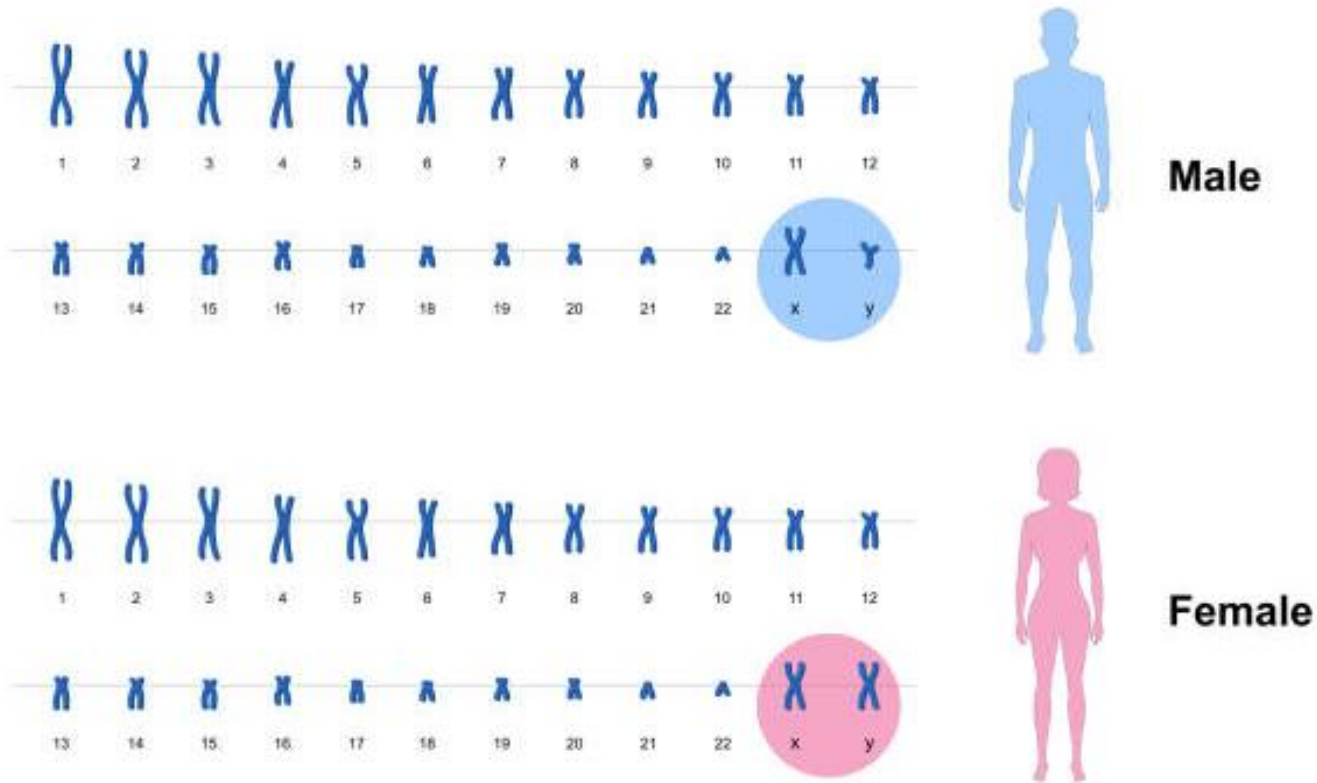
**Medical
Research Community**

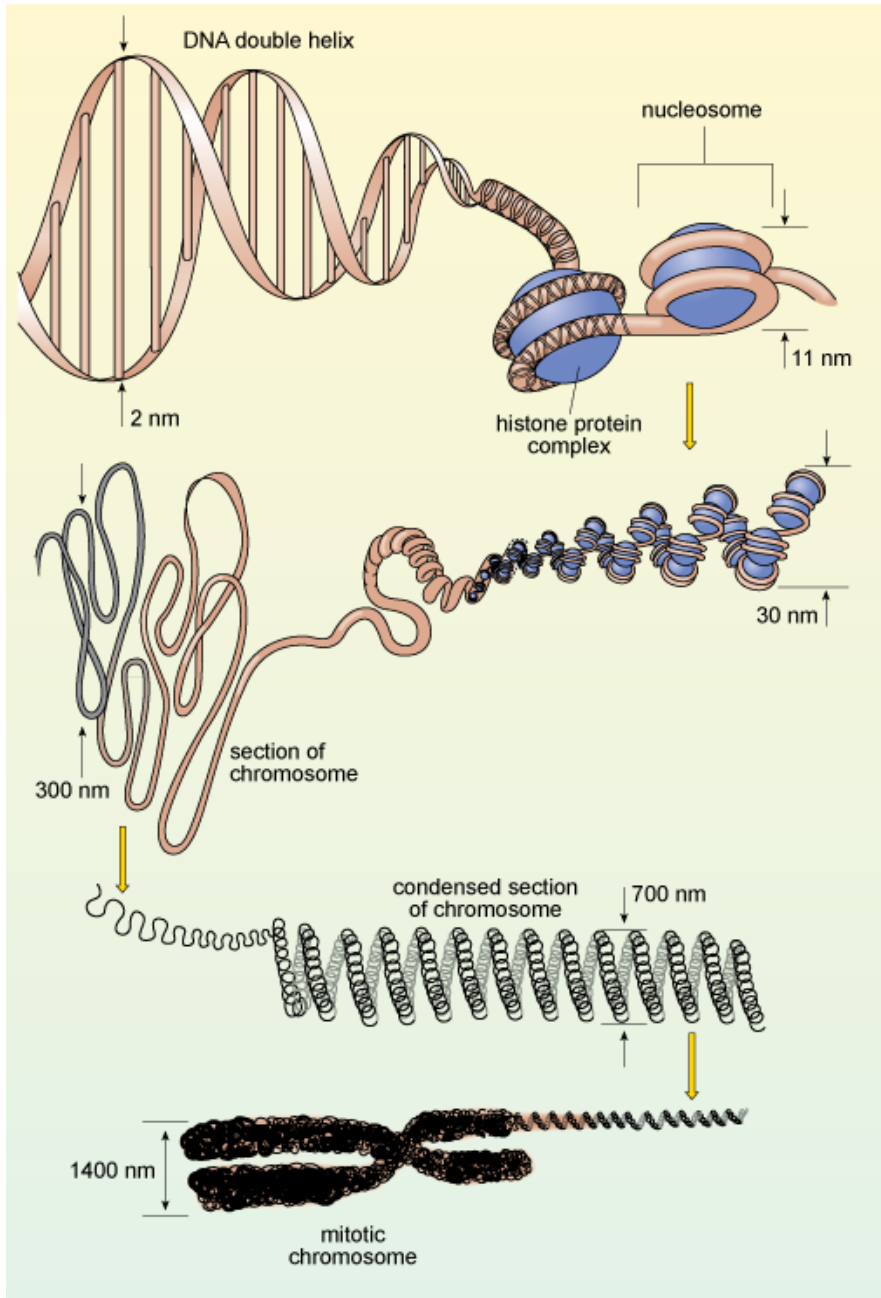


03:30



Human chromosomes





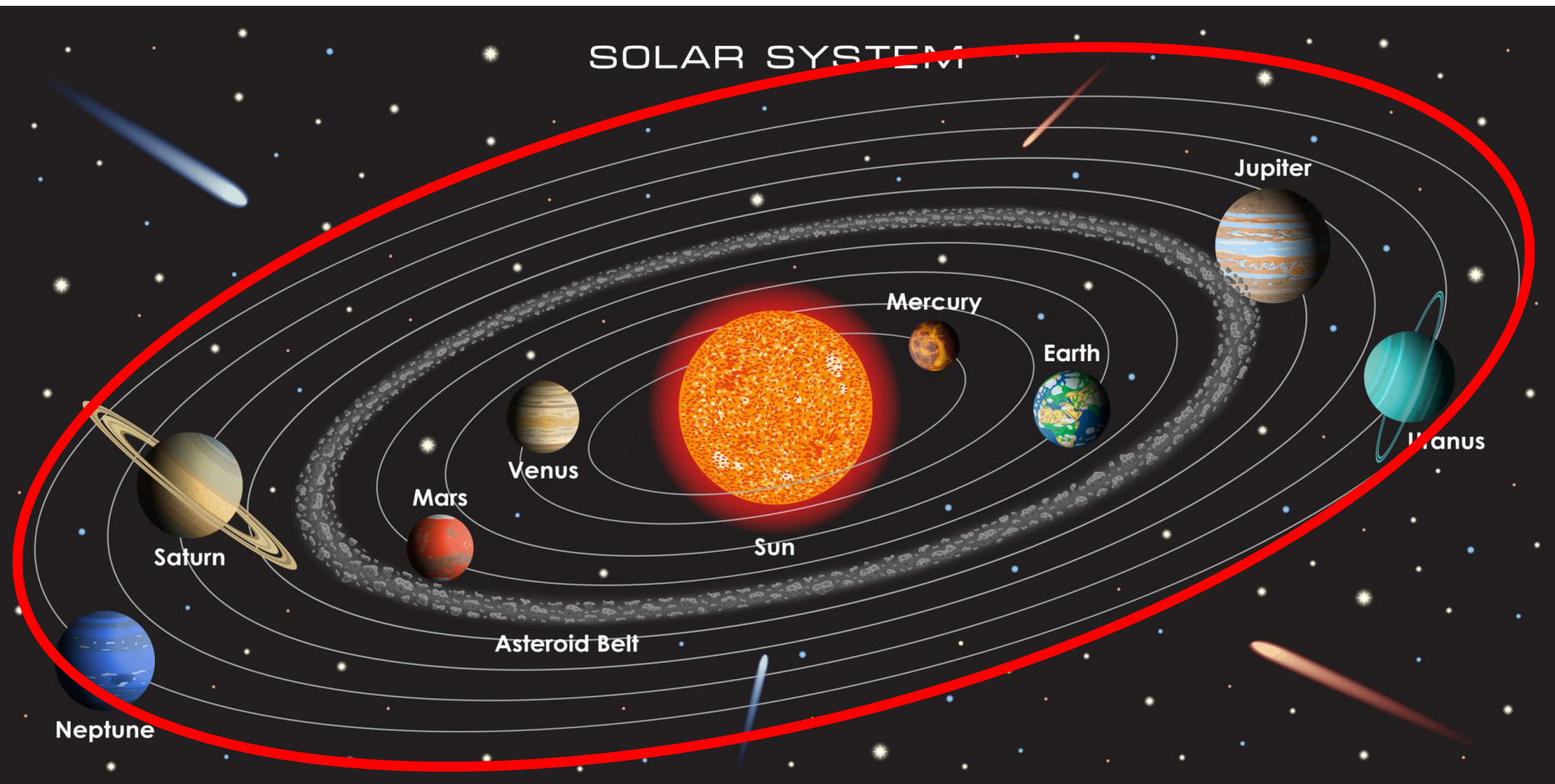
Nucleus is very small
and DNA molecule is
very long (but thin)

Spools and winding
round and coiling

1 cell – ~ 2 meters of
DNA

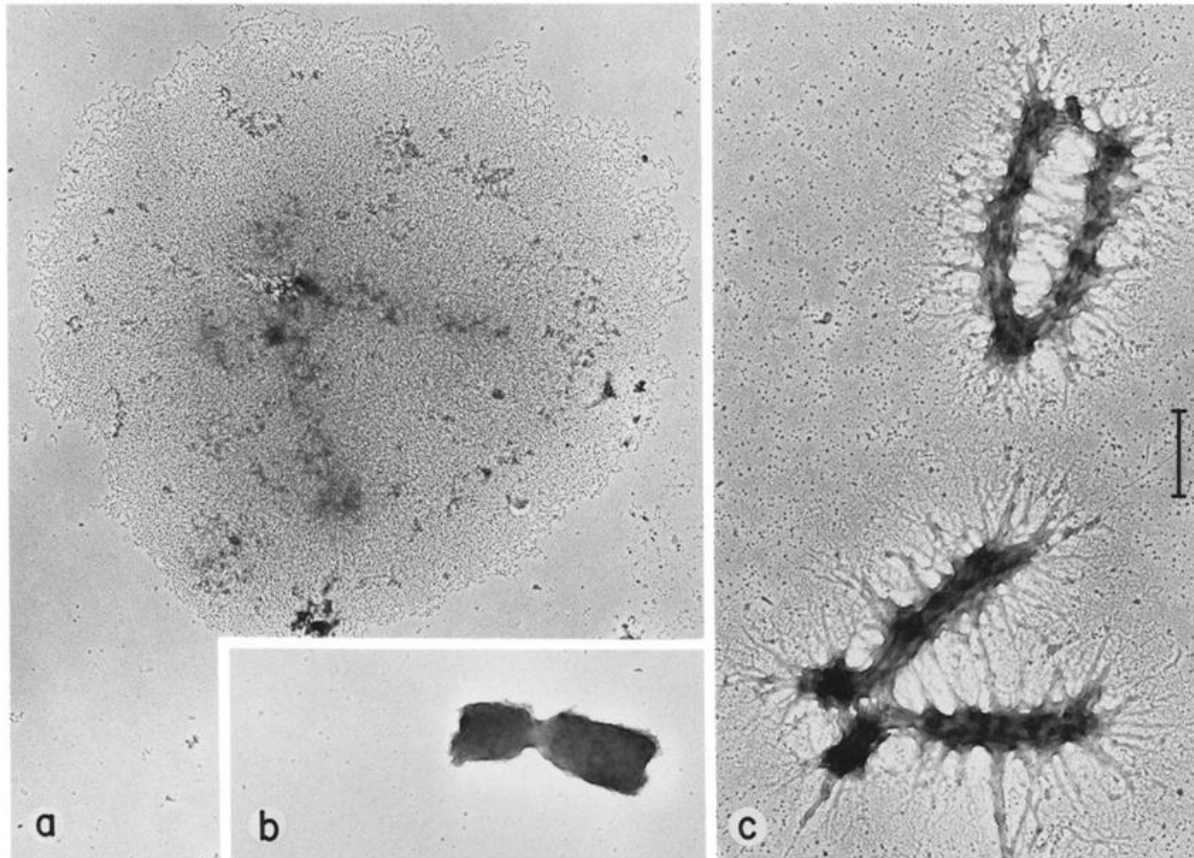
30,000,000,000,000
cells

Length of all DNA molecules in you body

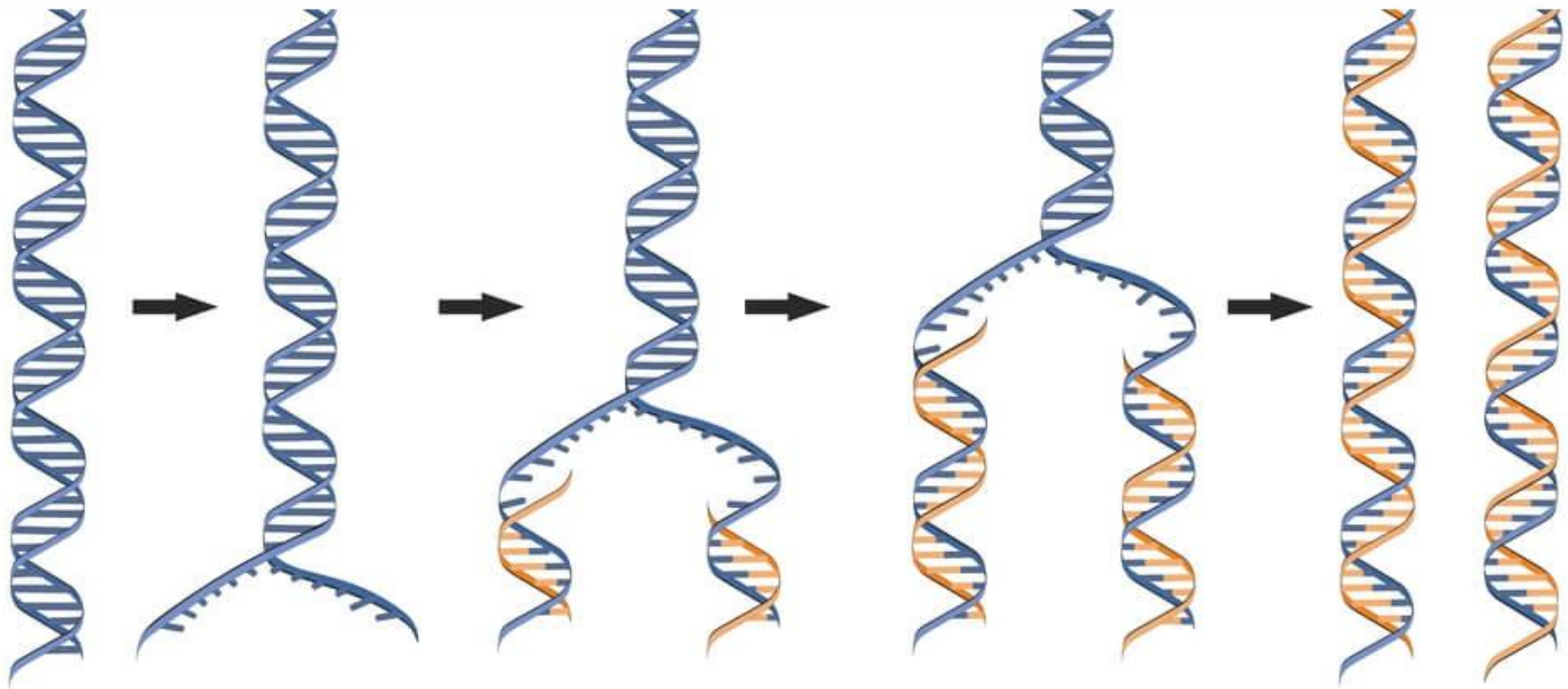


DNA compactization (packaging)

Packing for storage and unpacking for copying



How to make two copies of DNA from a one molecule??



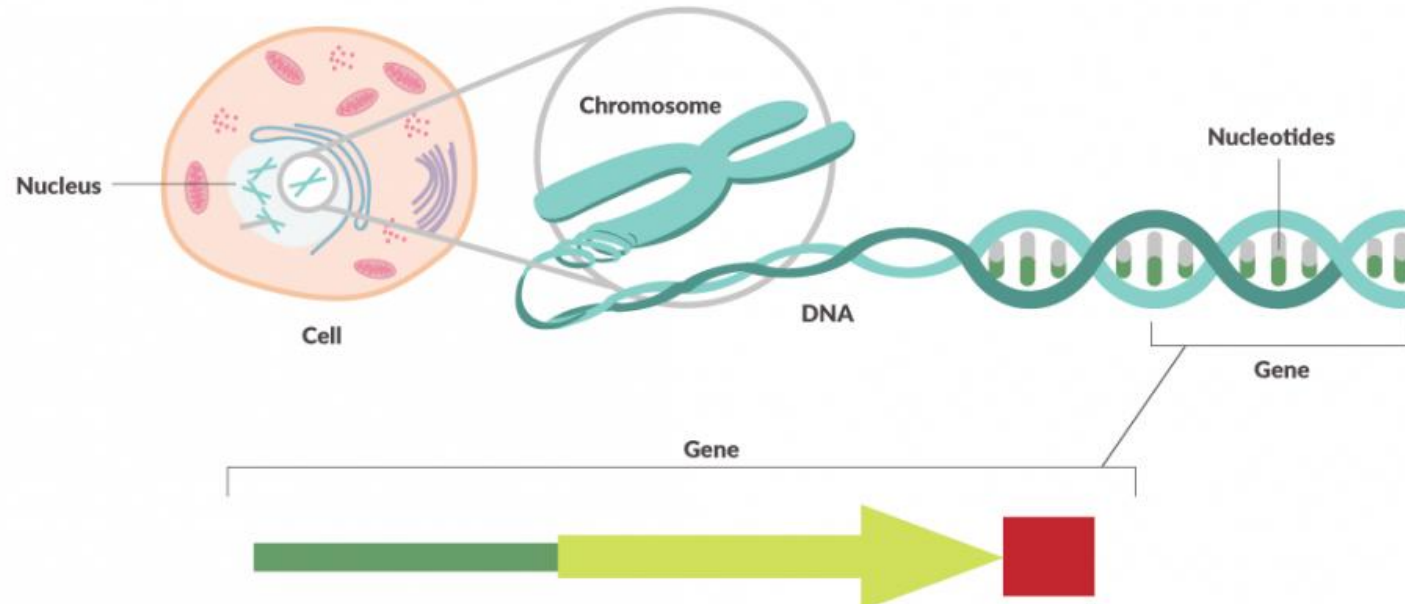
DNA replication

Replica - an exact copy or model

BUT first fully unpacking before cell division!

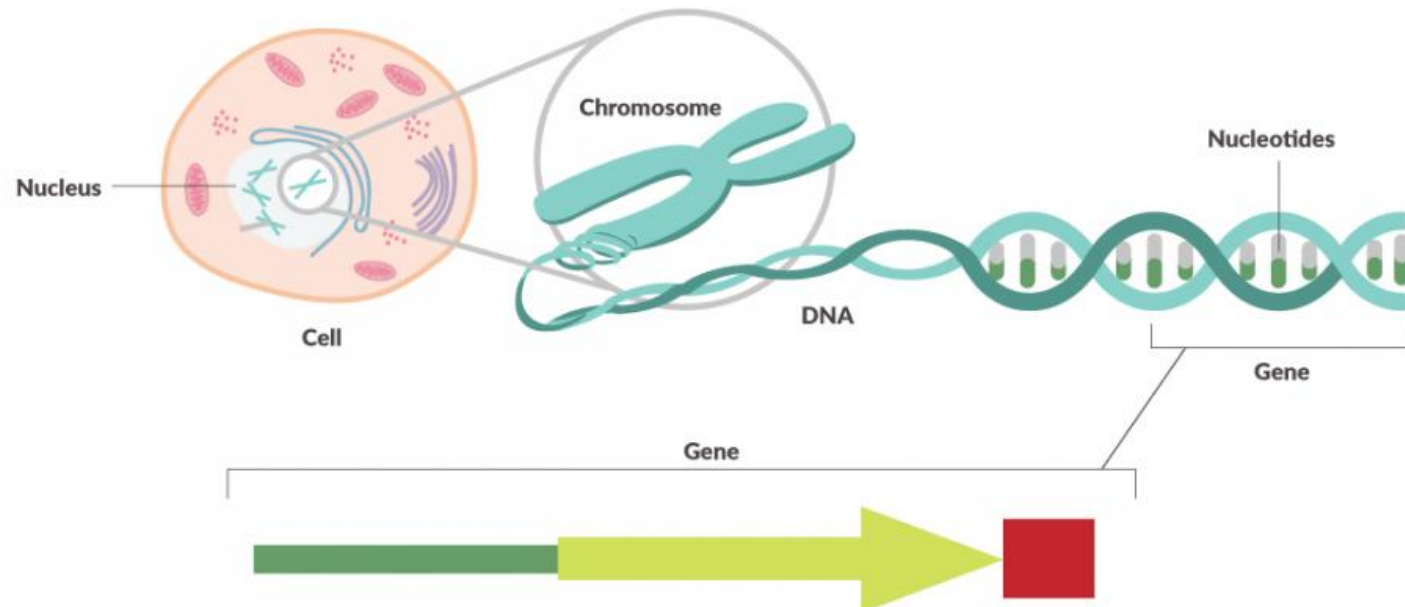
What is the function of DNA??






General structure of DNA = list of instructions in chapters



What is the function of DNA??

General structure of DNA = list of instructions in chapters



Species	<i>Escherichia coli</i>	<i>Gallus gallus</i>	<i>Homo sapiens</i>	<i>Daphnia pulex</i>	<i>Oryza sativa</i>
Number of Genes	~4,200	~17,000	~21,000	~31,000	~38,000
Common Name	 Bacteria	 Chicken	 Human	 Water flea	 Rice

DNA size difference



133 Gb

Marbled lungfish (*Protopterus aethiopicus*)

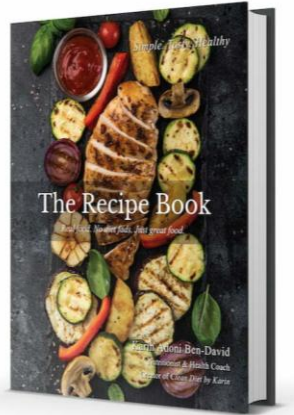
Why???



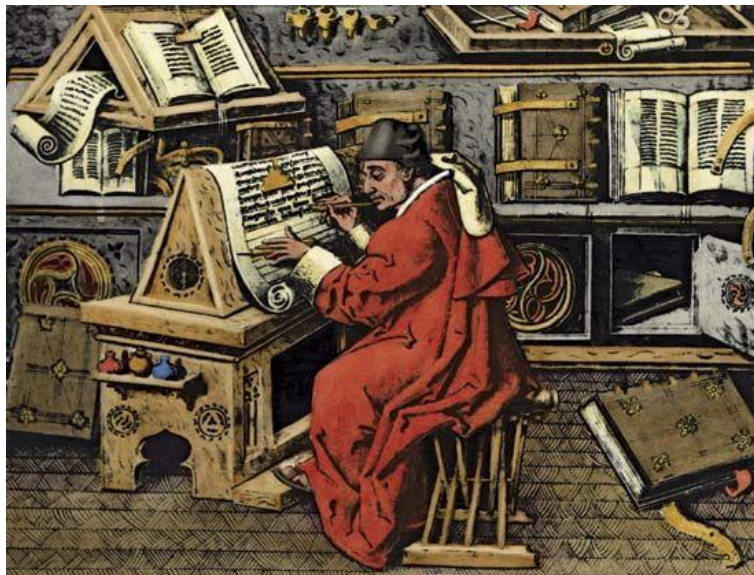
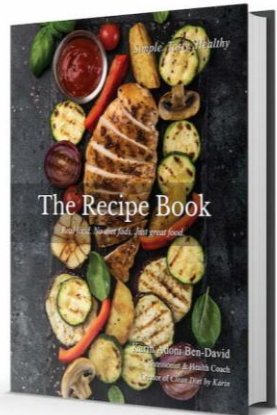
0.35 Gb

Japanese pufferfish (*Takifugu rubripe*)

New cook book with recipes



New cook book with recipes



Pompano en Papillotes

- 3 green onions, chopped
- 3 oz. mushrooms, chopped
- 1 Tbsp. butter
- 1 C. stock
- 2 Salt & pepper
- ¼ & white wine
- 2 lbs pompano fillets
- 1 C crab meat
- 4 T. butter
- 1 T. white wine
- ½ tsp. salt, 1 egg yolk
- 1 lemon sliced

Brown onions-mushrooms (lightly) in butter - mix in flour, add stock, season & boil 5 minutes! Add wine.

Sauté fillets & crab meat separately in butter 5 min, 20 crab meat add wine salt and slightly beaten egg yolk - cook until thickened, stirring constantly.

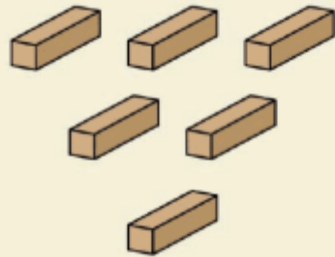
Place some of crab meat mixture on half of each fillet, & fold other half over it. Cover with sauce, fold well inside parchment cooking paper - or place in paper bag.

Bake in hot oven 425° about 10 min. Arrange on platter - garnish with lemon slices. Serves 6.

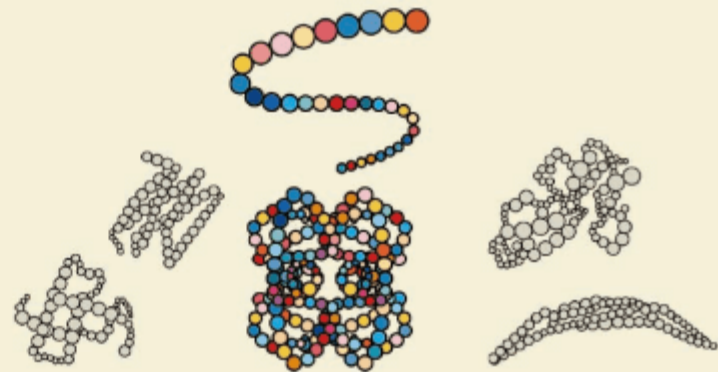
Vintage Recipes/Pompano-en-Papillote

Proteins are building blocks of life

Amino acids are the building blocks of proteins



Free amino acids

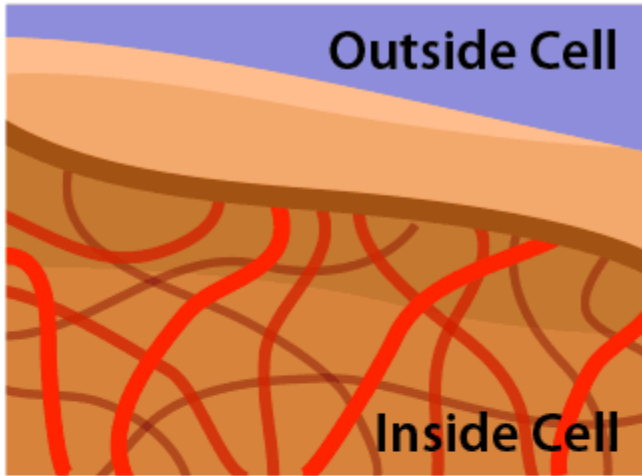


100,000 kinds
of Proteins

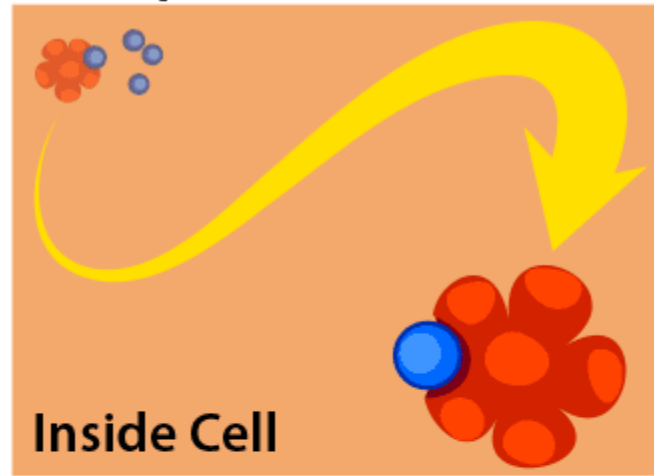


Proteins are building blocks of life

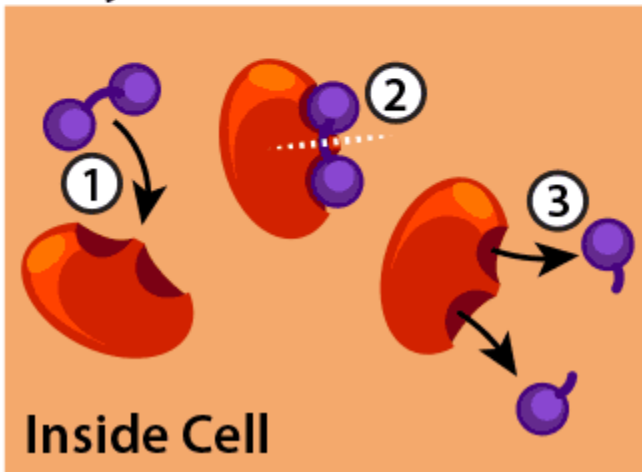
Structure Protein



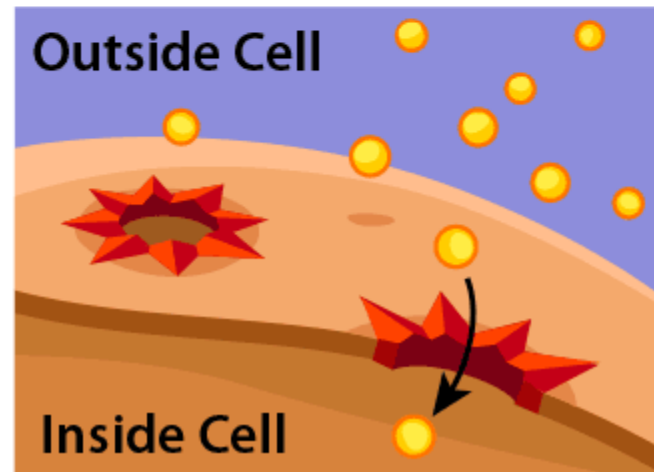
Transport Protein



Enzymes

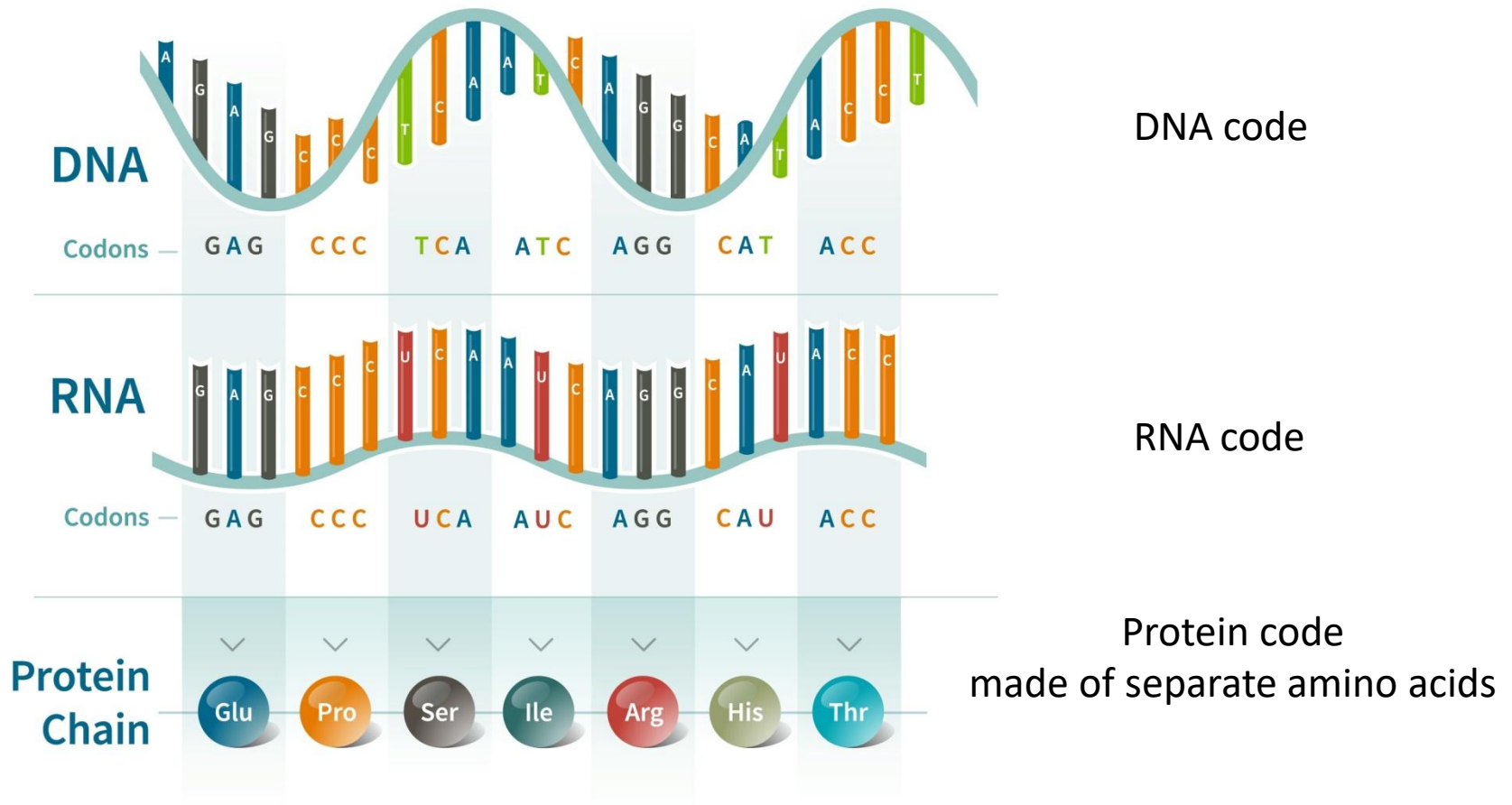


Channels



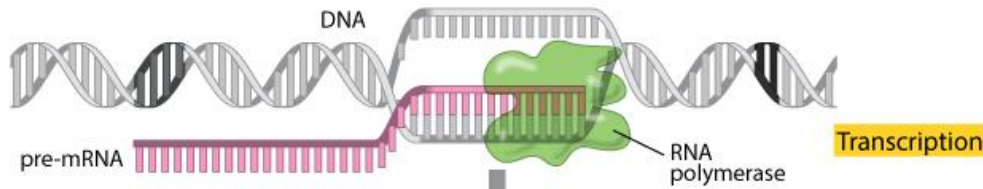
What is the function of DNA??

How to use info in DNA without damaging ?



What is the function of DNA??

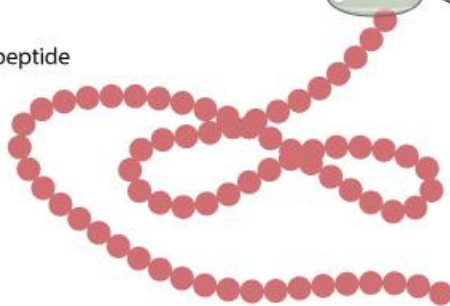
How to use info in DNA without damaging ?



1 copy of RNA



polypeptide



1000 copies of proteins

Lets make a protein!

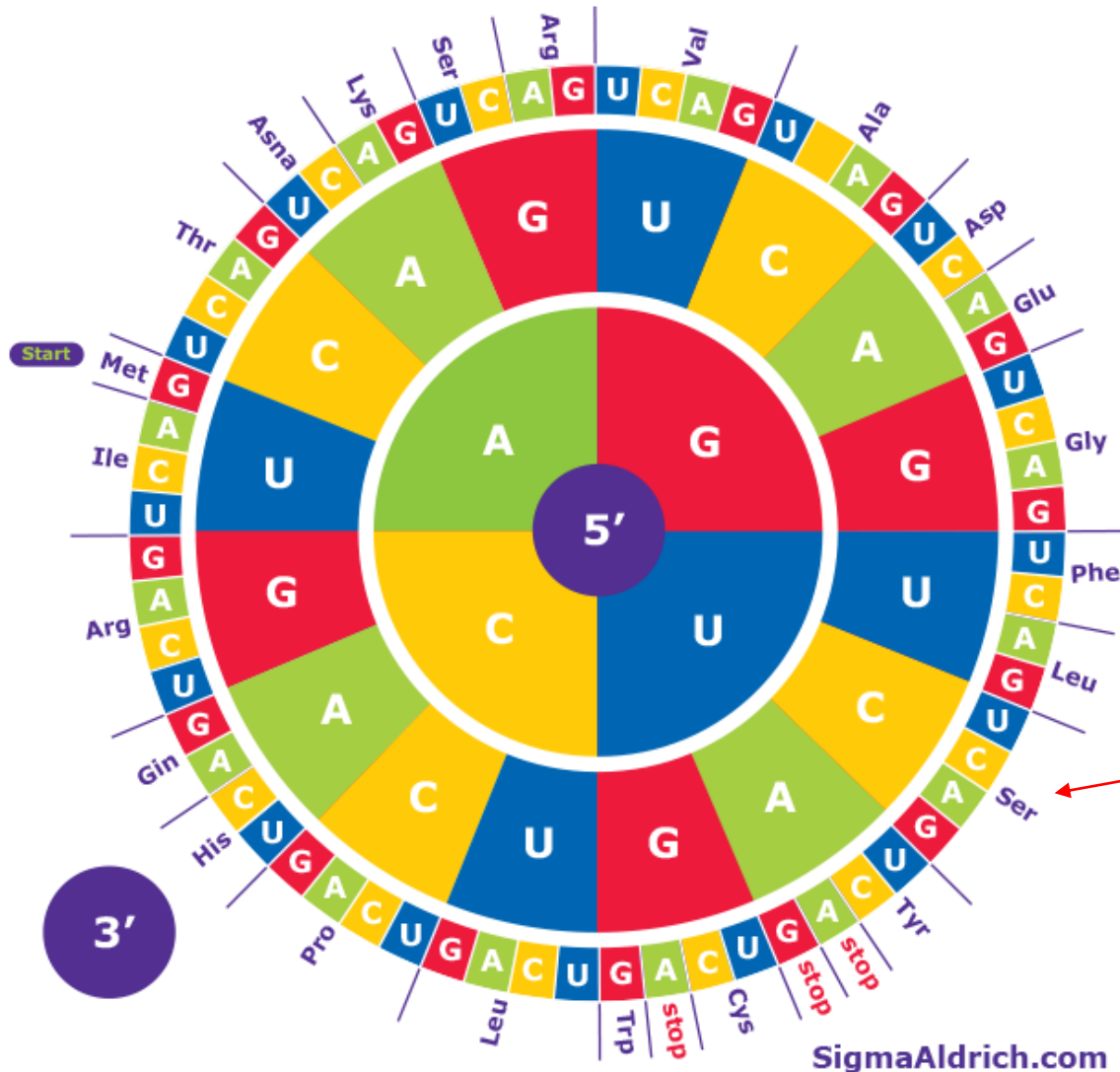
RNA code:

AUG GAA AUC UCG UAA

Protein code - ??????

Example:

UCG = Ser



From DNA to proteins



Human normoblasts, which comprise less than 0.2% of the total cell mass in the human body, collectively replicate about 4 kilometers of DNA every second [[10](#)]. This is nearly 12 times faster than the speed of sound, which travels 0.34 kilometers per second in air. This rate of DNA synthesis, if extrapolated for the entire human population in terms of total DNA length, would be able to trace the orbit of Pluto in just 1.3 seconds [[10](#)]. To put in perspective, Pluto has an orbital period of 247 years and it has completed only one-third its orbit around the sun since its discovery in 1930.