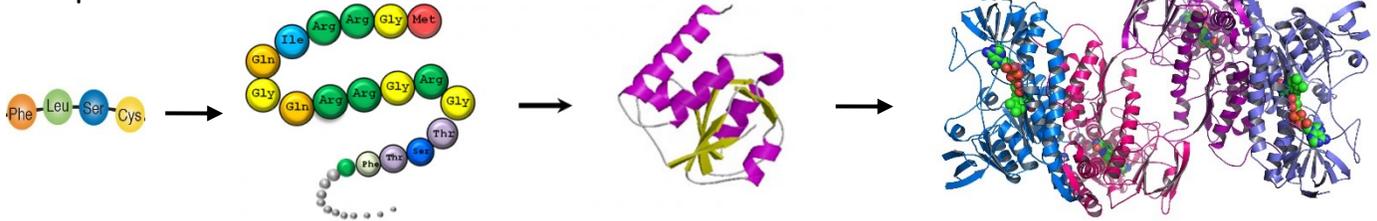


5. Proteins and Protein Synthesis

- Proteins

- : large complex molecules made up of **amino acids** that make up the traits of an organism
Ie) body structures, hormones, enzymes & antibodies
= make up all the traits in the body (ie. blonde hair, tongue rolling)
- : it is the **order** and **number** of amino acids within a protein that determine the type of protein present



Amoeba Sisters: Protein Synthesis: <https://www.youtube.com/watch?v=oefAI2x2CQM>

- Protein Synthesis

- : the process through which cells make proteins (= making of traits on a molecular level)
- : uses the instructions on the **DNA**
= the sequence of the nitrogenous bases in a DNA molecule provide the **chemical code** (instructions) for a protein



: the process of protein synthesis is similar to building a house

= blueprints are used to put the building materials together at a construction site.

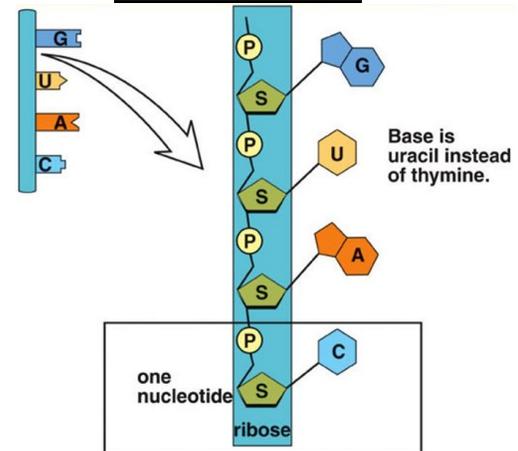
: DNA synthesizes proteins with the help of another nucleic acid called **Ribonucleic Acid**

- RNA Structure:

- : single stranded molecule (1 side of the ladder)
- : made of nucleotides containing:
 - ribose sugar instead of deoxyribose sugar
 - the same bases as DNA (Adenine, Cytosine and Guanine) except **URACIL** instead of thymine
- : there are three kinds of RNA --

1. mRNA (messenger)

- = the **blueprint** for protein construction
- carries building instructions from the nucleus to the ribosomes
- on a mRNA strand **three adjacent** nitrogen bases are called a **codon** correspond to a specific amino acid ***Codon Table is on page 3 of these notes



2. rRNA (ribosomal)

- = construction site where protein is made
- are the part of the ribosome that mRNA attaches to

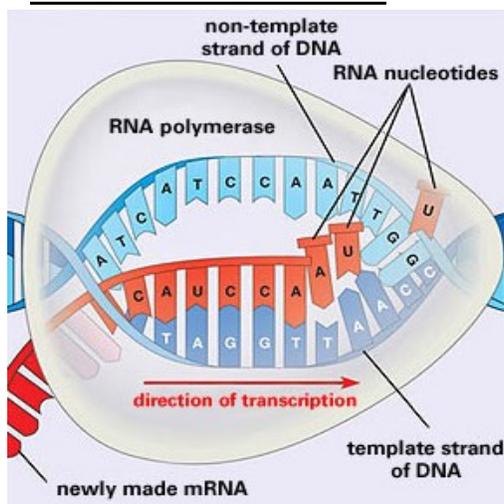
3. tRNA (transfer)

- = delivers proper amino acids to the right site at the right time
- one end of the molecule has an attachment site for amino acids
- the other end contains an anti-codon
 - = 3 exposed bases which match a complementary codon on mRNA
 - Cytosine bonds with Guanine
 - Uracil bonds with Adenine

- 2 Stages of Protein Synthesis

a) Transcription (in nucleus)

= use DNA to make RNA

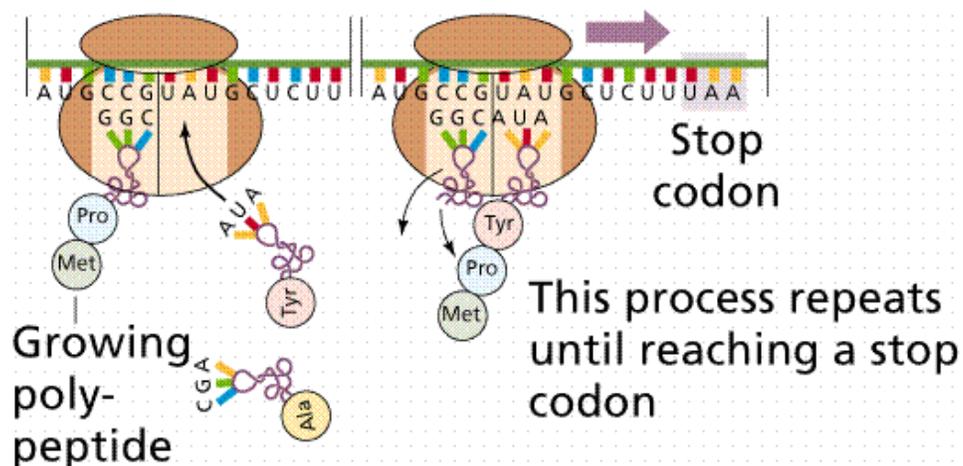


- 1) DNA uncoils (enzyme breaks H bonds)
- 2) DNA unzips, only 1 side of the DNA will be transcribed
- 3) mRNA constructed out of free nucleotides using a uracil based nucleotide instead of thymine
- 4) after mRNA is made, H bonds reform & DNA coils again
- 5) mRNA leave the nucleus and carries the code to the ribosomes in the cytoplasm

b) Translation (on ribosomes)

= construction of the amino acid sequence (protein)

- 1) mRNA attaches to the ribosome (rRNA) and is "read" by helper enzymes
- 2) tRNA picks up free amino acids in the cytoplasm and carries them to the mRNA
- 3) codons on mRNA determine the order amino acids are delivered by tRNA
- 4) as the process continues, amino acids are fused into a chain = a protein



mRNA Table of Codons

		Second letter				
		U	C	A	G	
First letter	U	UUU Phenyl-alanine UUC UUA Leucine UUG	UCU Serine UCC UCA UCG	UAU Tyrosine UAC UAA Stop codon UAG Stop codon	UGU Cysteine UGC UGA Stop codon UGG Tryptophan	Third letter U C A G U C A G U C A G
	C	CUU Leucine CUC CUA CUG	CCU Proline CCC CCA CCG	CAU Histidine CAC CAA Glutamine CAG	CGU Arginine CGC CGA CGG	
	A	AUU Isoleucine AUC AUA AUG Methionine; start codon	ACU Threonine ACC ACA ACG	AAU Asparagine AAC AAA Lysine AAG	AGU Serine AGC AGA Arginine AGG	
	G	GUU Valine GUC GUA GUG	GCU Alanine GCC GCA GCG	GAU Aspartic acid GAC GAA Glutamic acid GAG	GGU Glycine GGC GGA GGG	

