

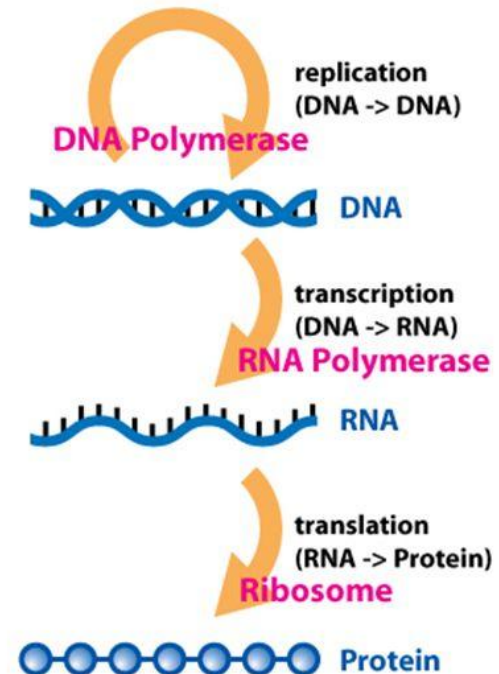
# **RNA translation**

# The Central Dogma of Molecular Biology

- Information is transferred from DNA to RNA to protein

**DNA -> RNA -> Protein**

- Proteins create traits
- This is called **gene expression**
- This process is found in all organisms



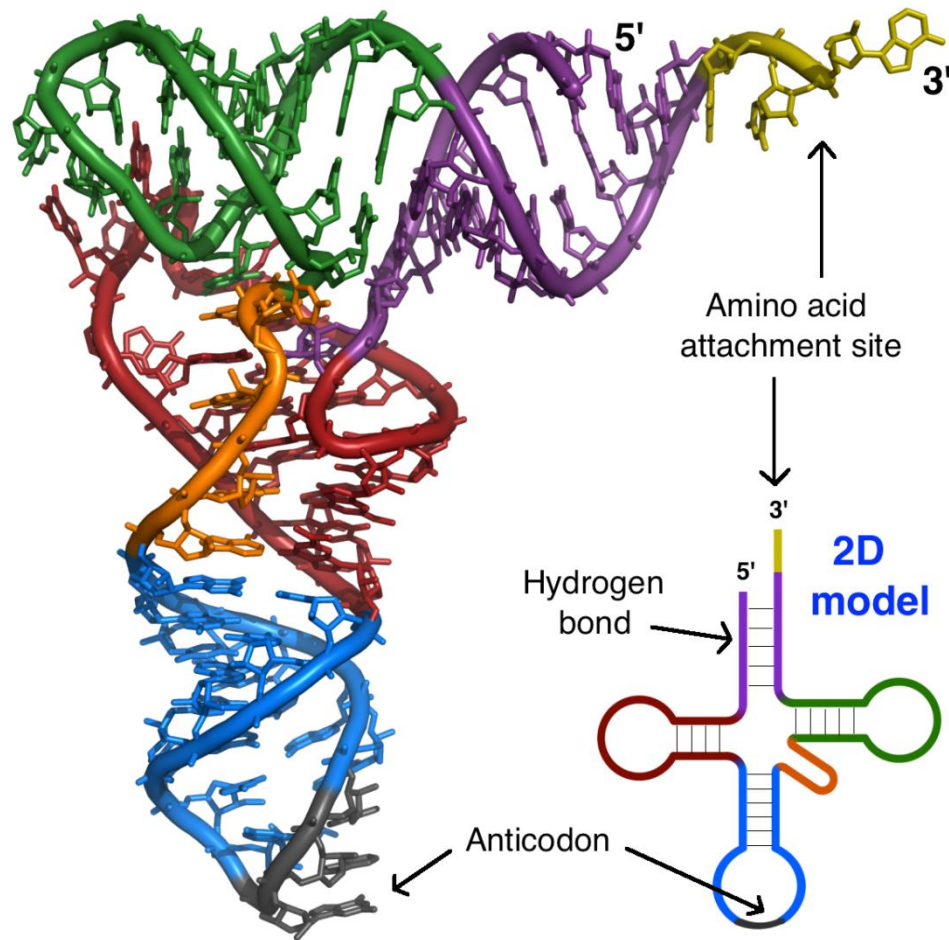
- RNA transcribed from DNA is called *messenger RNA (mRNA)*. It encodes the sequence of the protein to be synthesized.
- The protein is synthesized from monomers – amino acids bound to special small RNA molecules, called *transfer RNA (tRNA)*
- The protein synthesis is performed by a complex molecular machine called *ribosome*.

- The set of rules by which information encoded within genetic material (DNA or mRNA sequences) is translated into proteins is called *genetic code*.
- The protein sequence is encoded in mRNA in nucleotide triplets called *codons*.
- There are 20 amino acids and 64 possible combinations of 3 consecutive bases. Therefore the genetic code is *degenerative*. For many amino acids there are more than one corresponding codon.

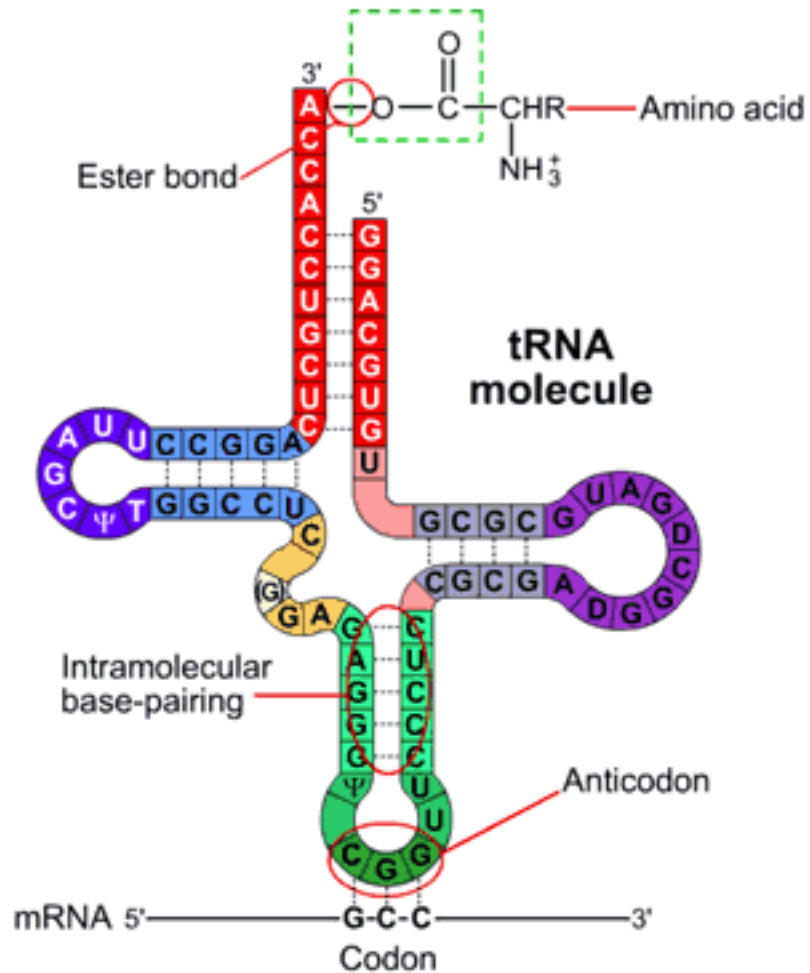
# Genetic code table

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } <b>UAA Stop</b> <b>UAG Stop</b>	UGU } Cys UGC } <b>UGA Stop</b> UGG Trp	U C A G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U C A G
	A	AUU } AUC } Ile AUA } <b>AUG Met</b>	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U C A G

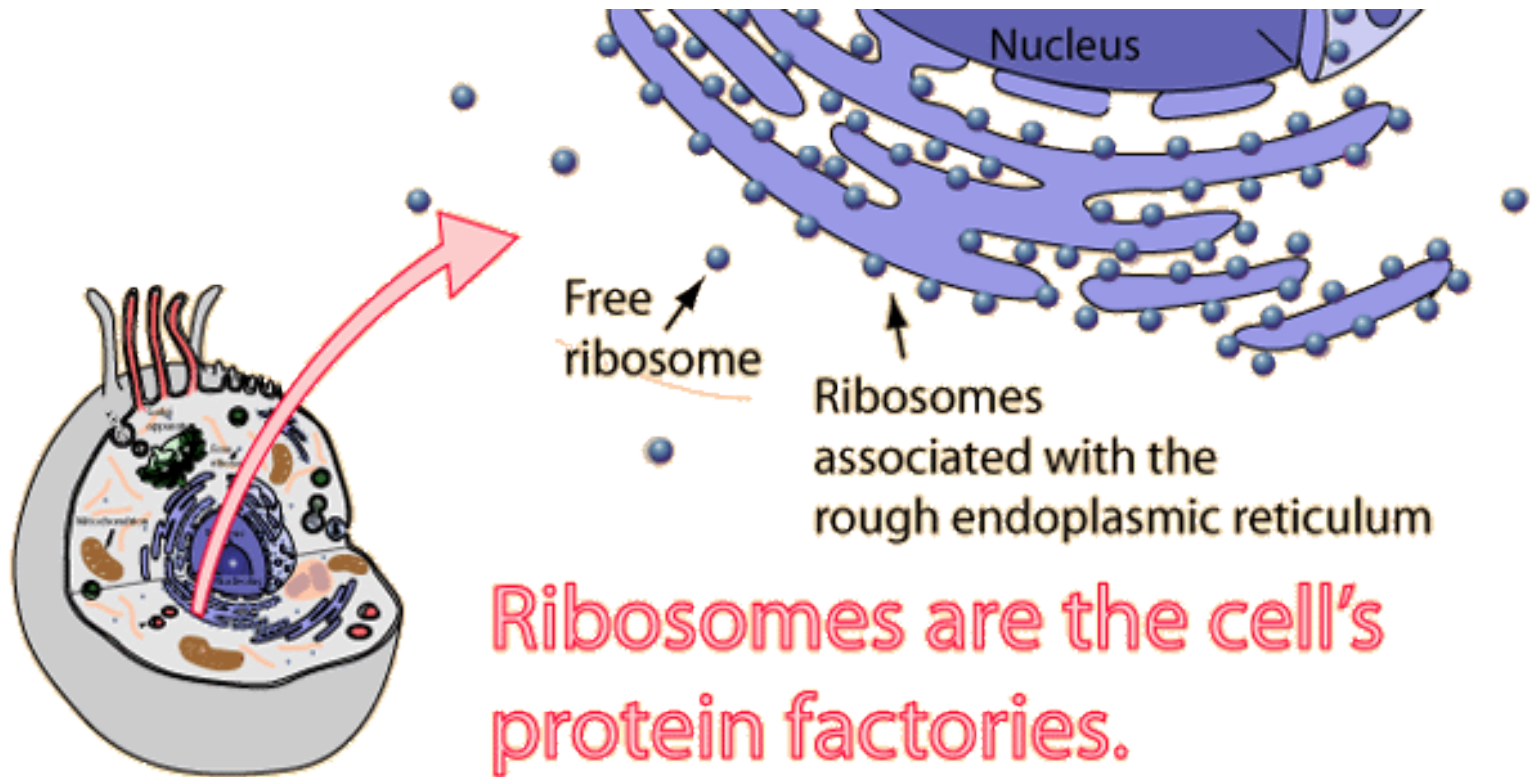
# tRNA



# tRNA

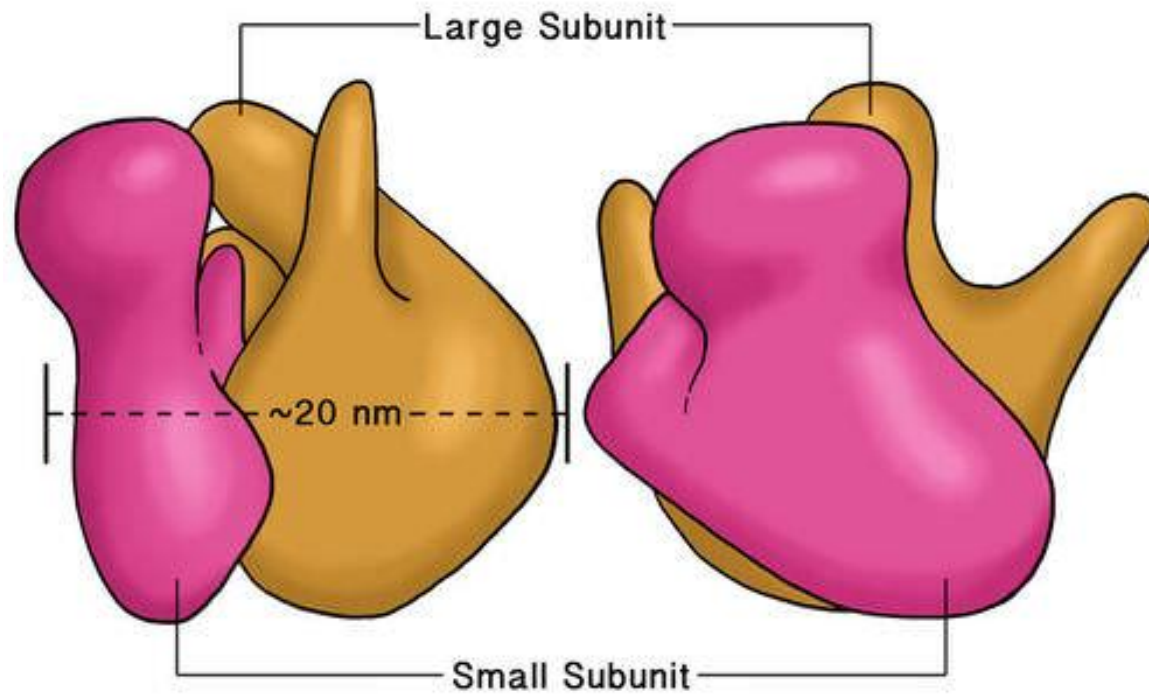


# Ribosome

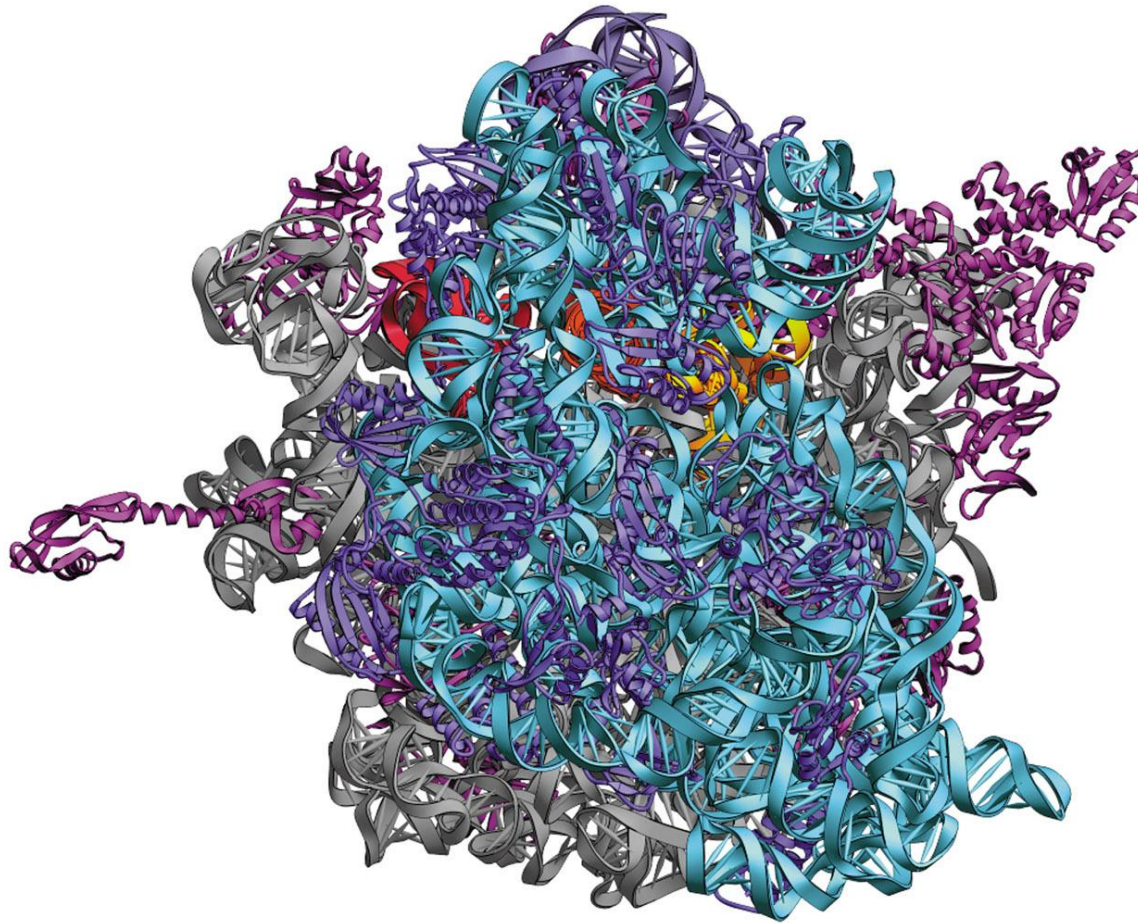




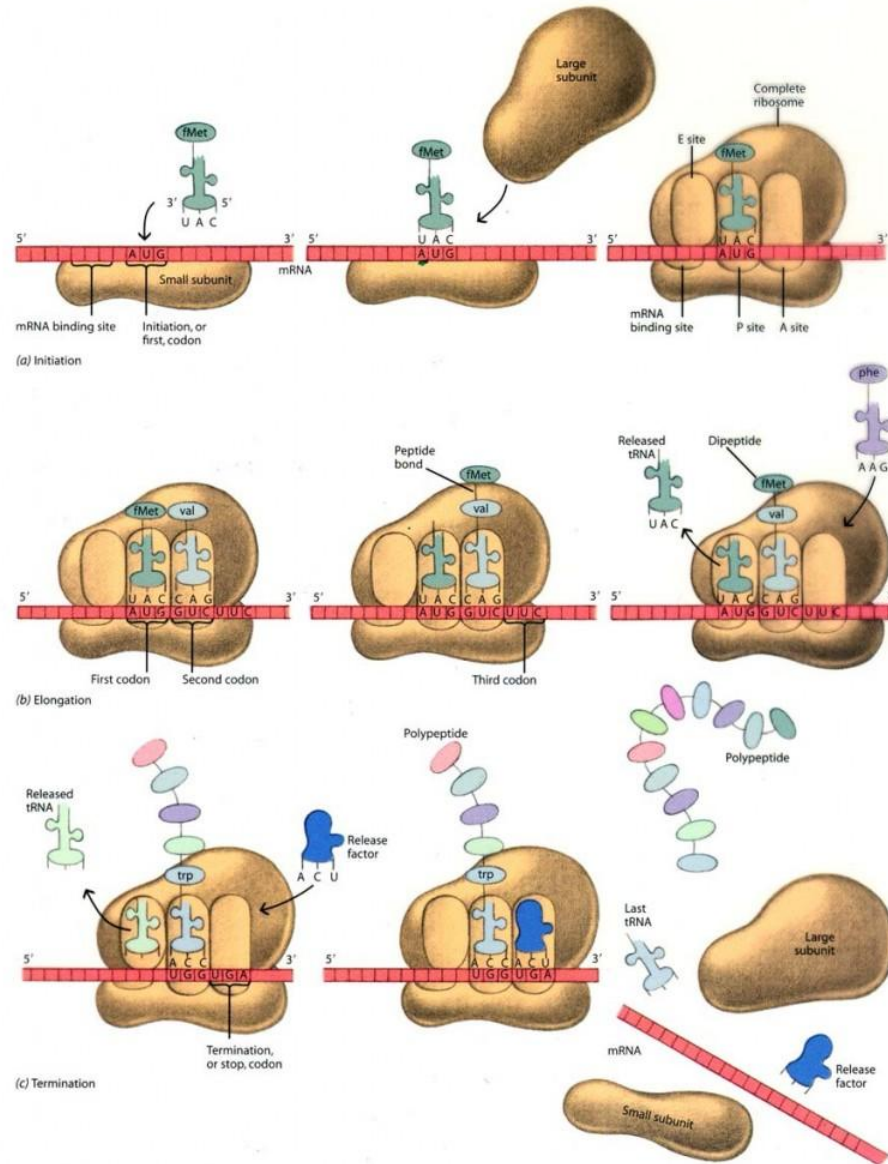
# Ribosome



# Ribosome

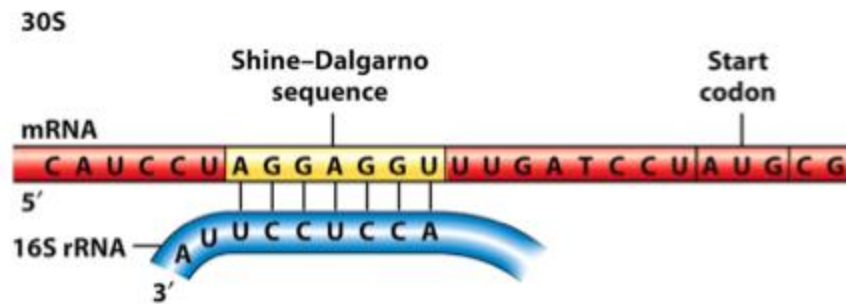
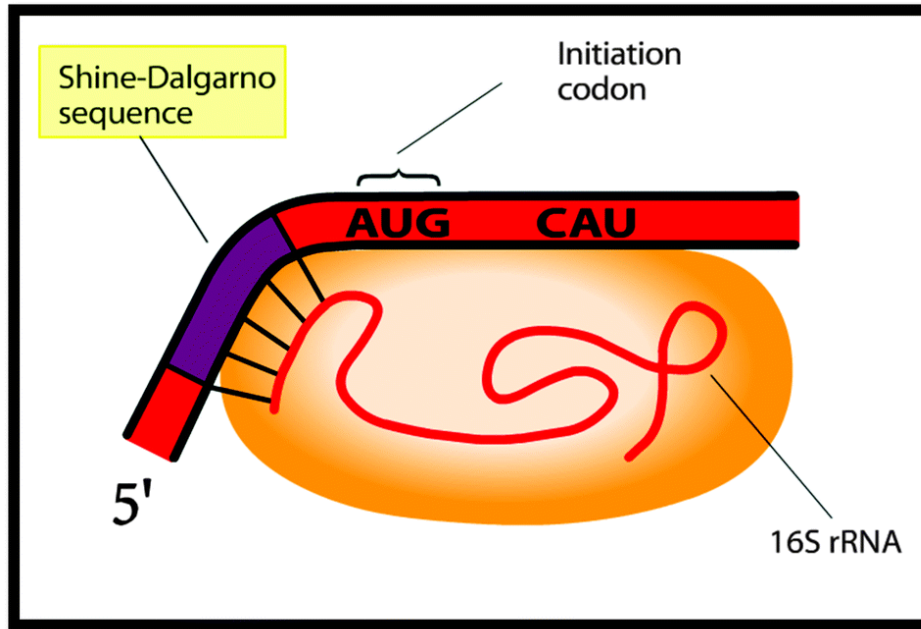


# Translation of RNA



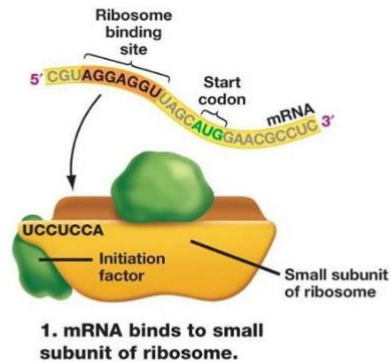
# Translational initiation in prokaryotes

- In prokaryotes translation begins with binding of ribosome to a specific sequence in the messenger RNA - Shine-Dalgarno (SD) Sequence. SD is a ribosomal binding site generally located around 8 bases upstream of the start codon **AUG**. The six-base consensus sequence is **AGGAGG**. It is complementary to a specific region of 16S ribosomal RNA.



## Translation initiation in bacteria

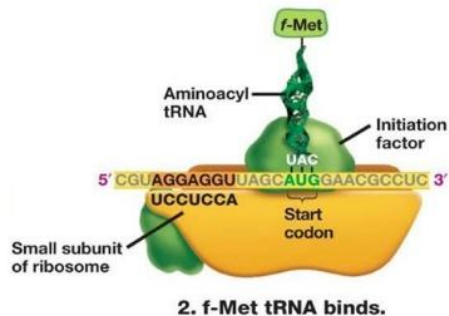
### Shine-Dalgarno sequence



## Translation initiation in bacteria

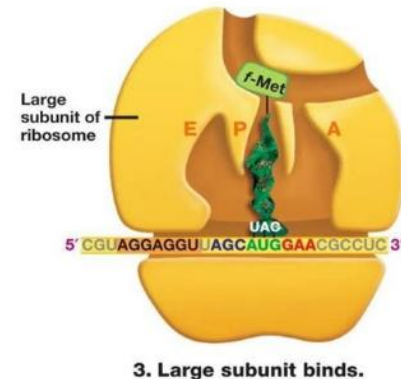
### Initiator tRNA in bacteria

1. The initiator tRNA (fMet-tRNA) gets carried to the complex (30S ribosome + IF1 + IF3) by initiation factor IF2 using GTP.



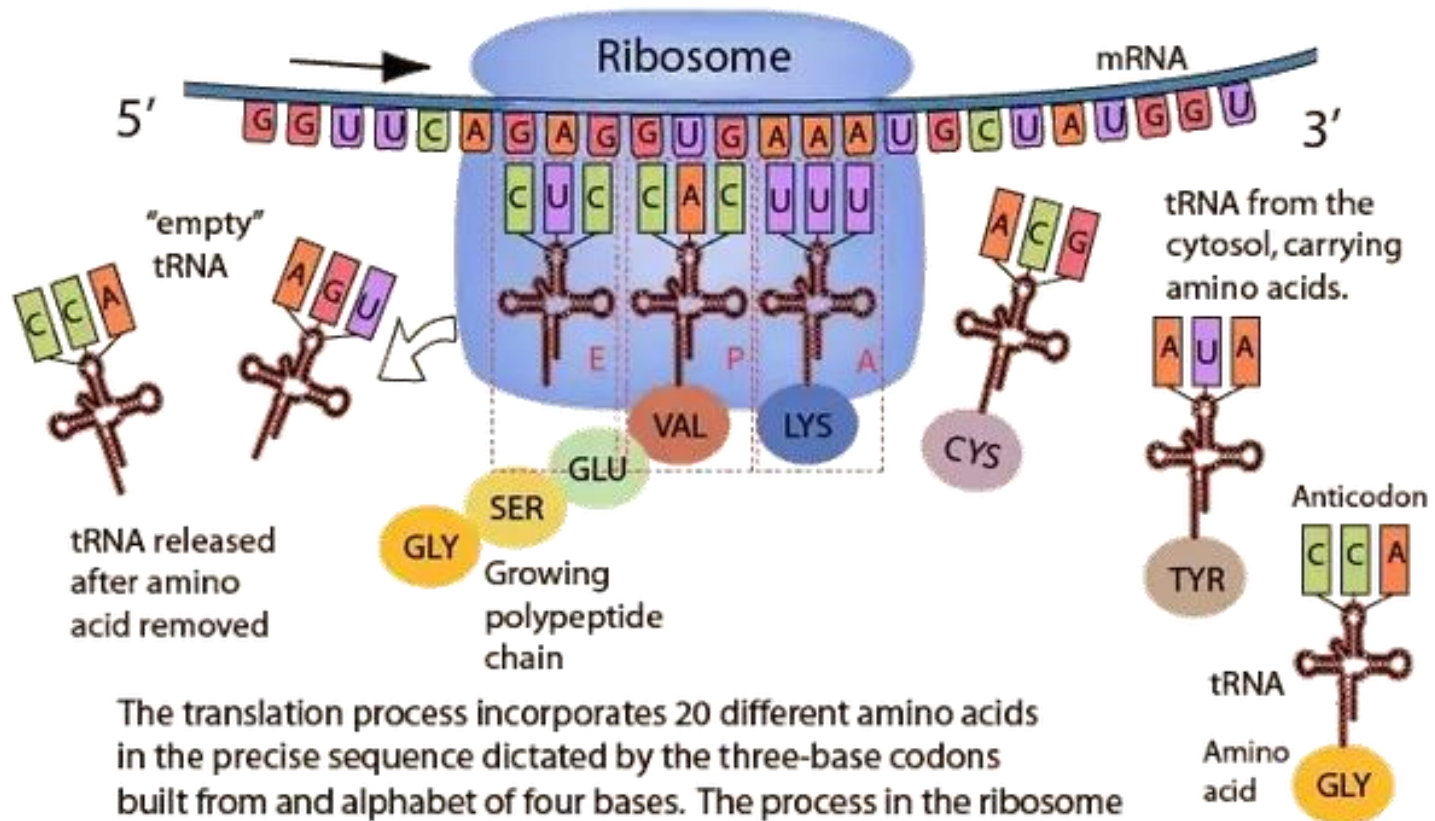
## Translation initiation in bacteria

- The initiation factors (IF1 and IF3) gets released and the resulting complex is called **the initiation complex**.



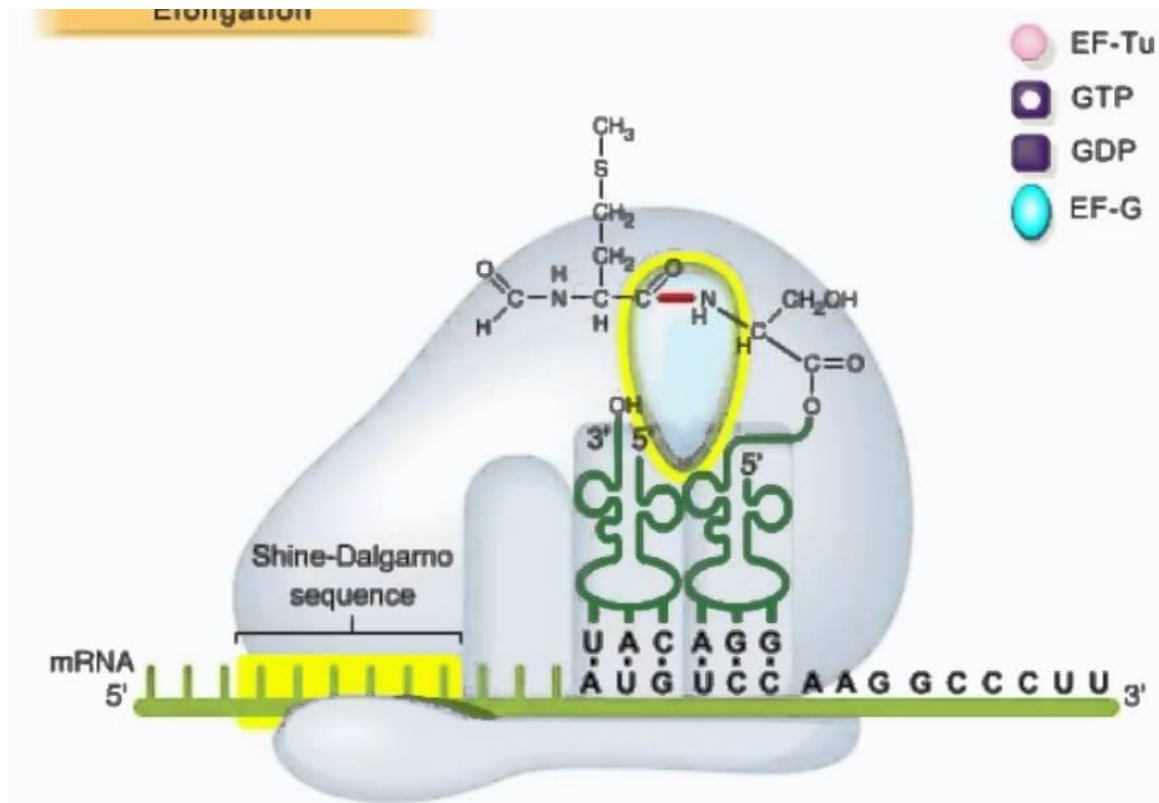


# Elongation



The translation process incorporates 20 different amino acids in the precise sequence dictated by the three-base codons built from an alphabet of four bases. The process in the ribosome builds the polypeptide chains that will become proteins.

# Elongation



☒ Narration

Play

Peptide bond formation is a condensation reaction that results in the release of water. At one time it was thought that peptidyl transferase was an enzymatic protein. However, more recently, it was discovered that peptidyl transferase is a catalytic RNA molecule. An RNA capable of catalyzing a reaction is called a ribozyme.

Page 4 of 7



Replay



☒ Pause between scenes



# Elongation

