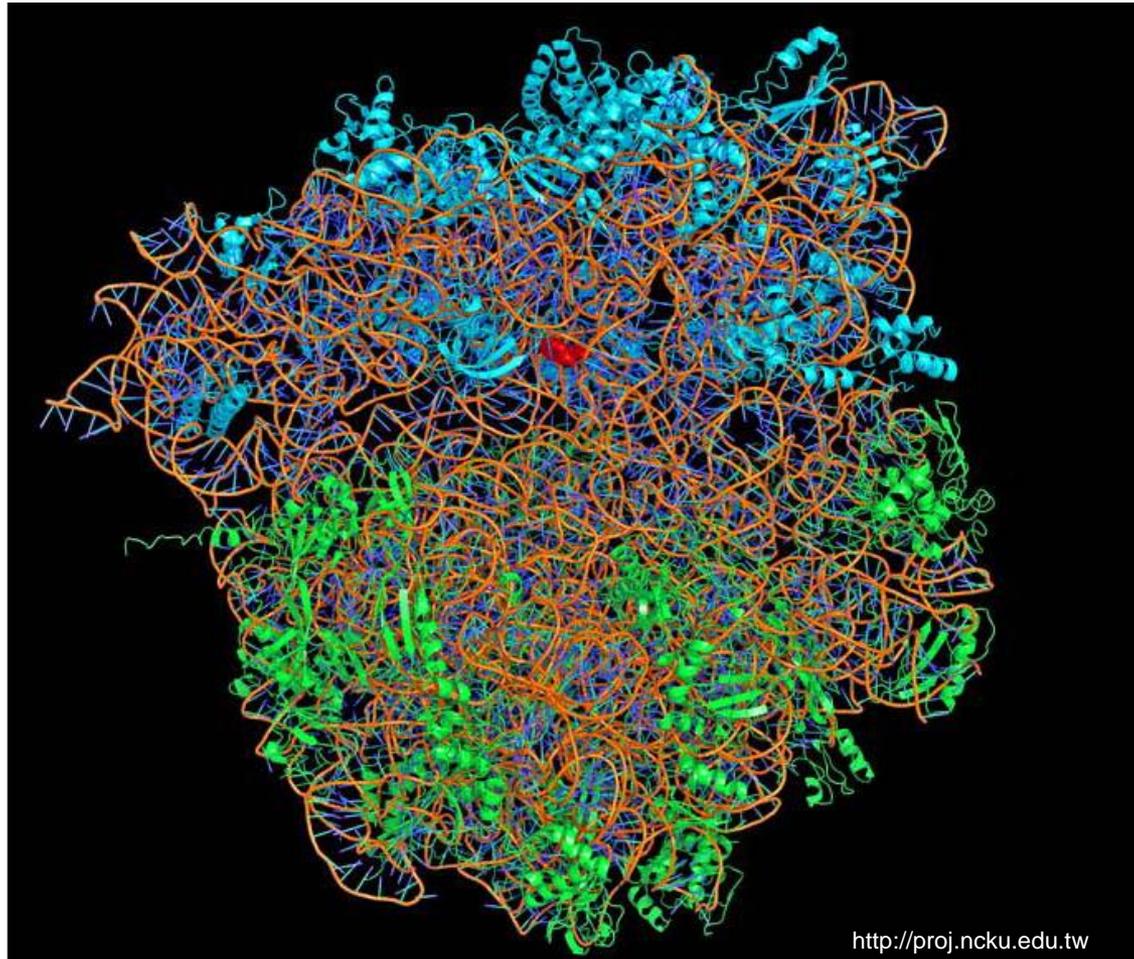
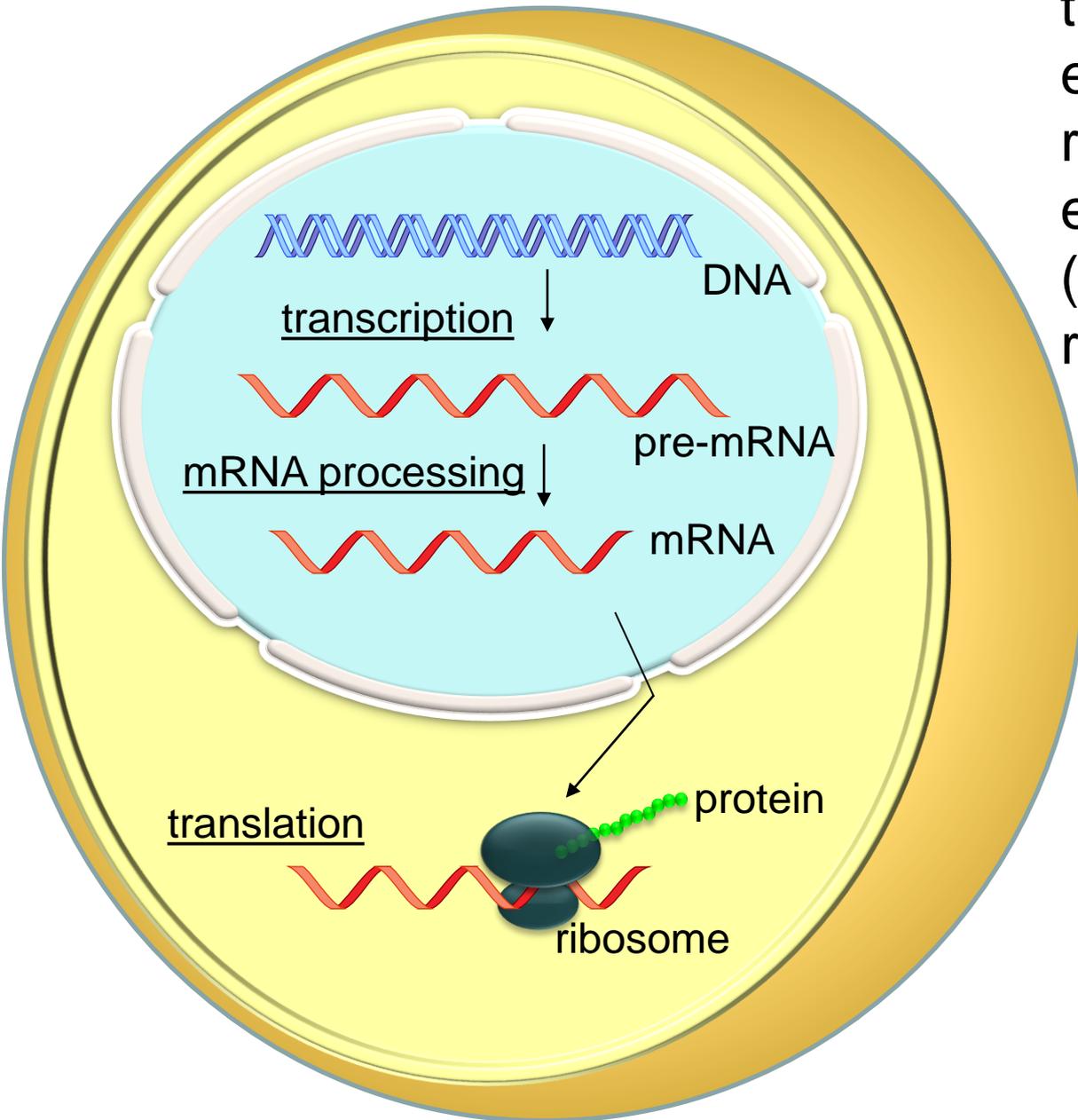


Translation: Synthesis of proteins



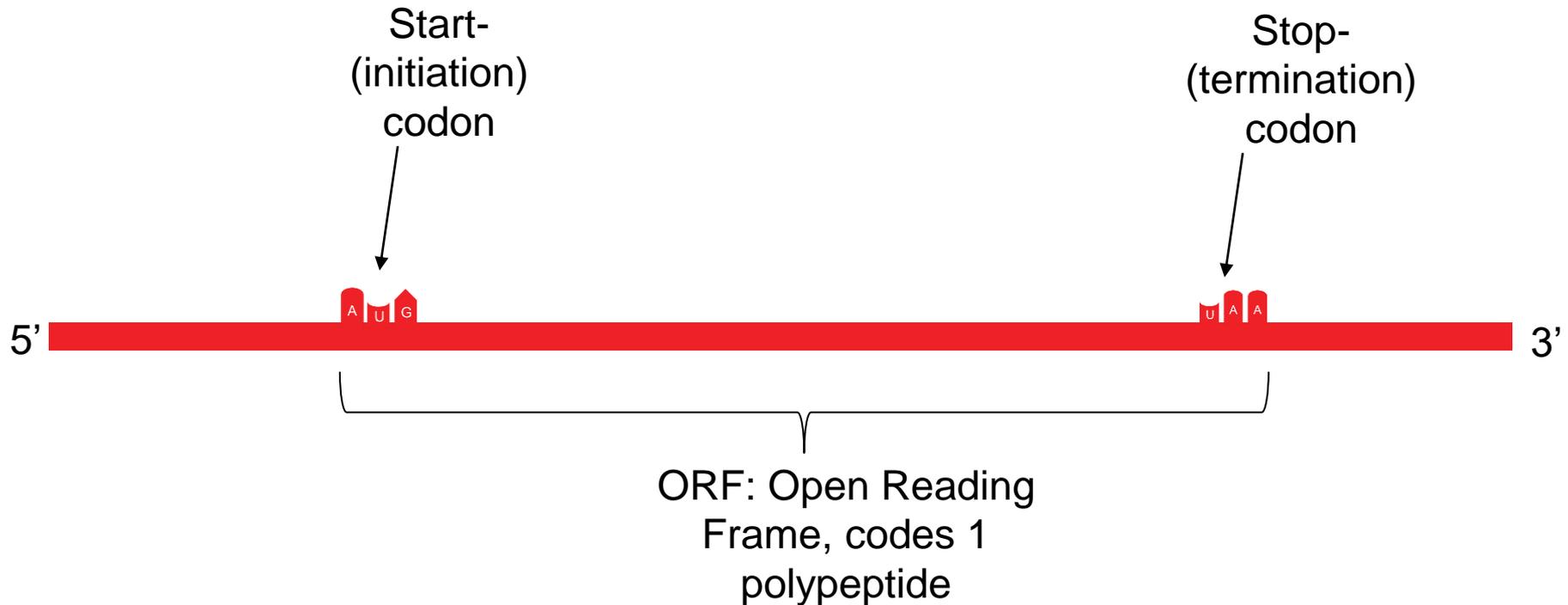
ribosome

The site of translation:
the cytoplasm. In
eukaryotes: the
ribosomes on the Rough
endoplasmic reticulum
(RER) and free
ribosomes.



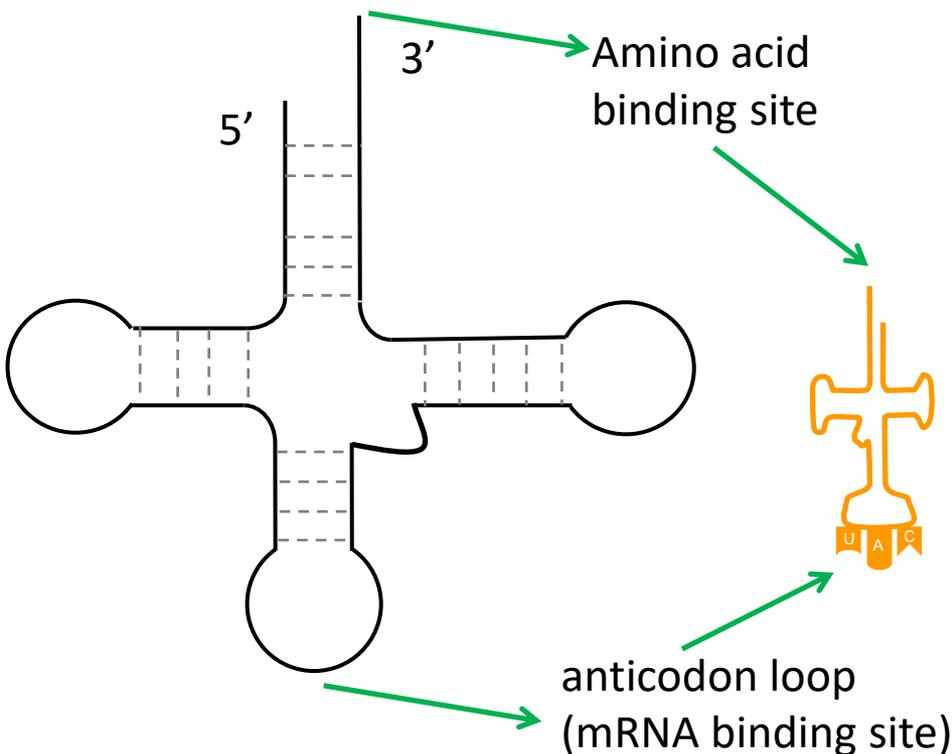
Translation: the participants of protein synthesis

- The mRNA is providing the information to build up polypeptides.
- The information is showing the amino acid sequence, coded by the genetic code.
- The direction of reading the code is 5' → 3' on the mRNA,
- On the new polypeptide: N terminus → C terminus



Translation: the participants of protein synthesis

- tRNA: the CCA sequence on its 3' end is the binding site of amino acids

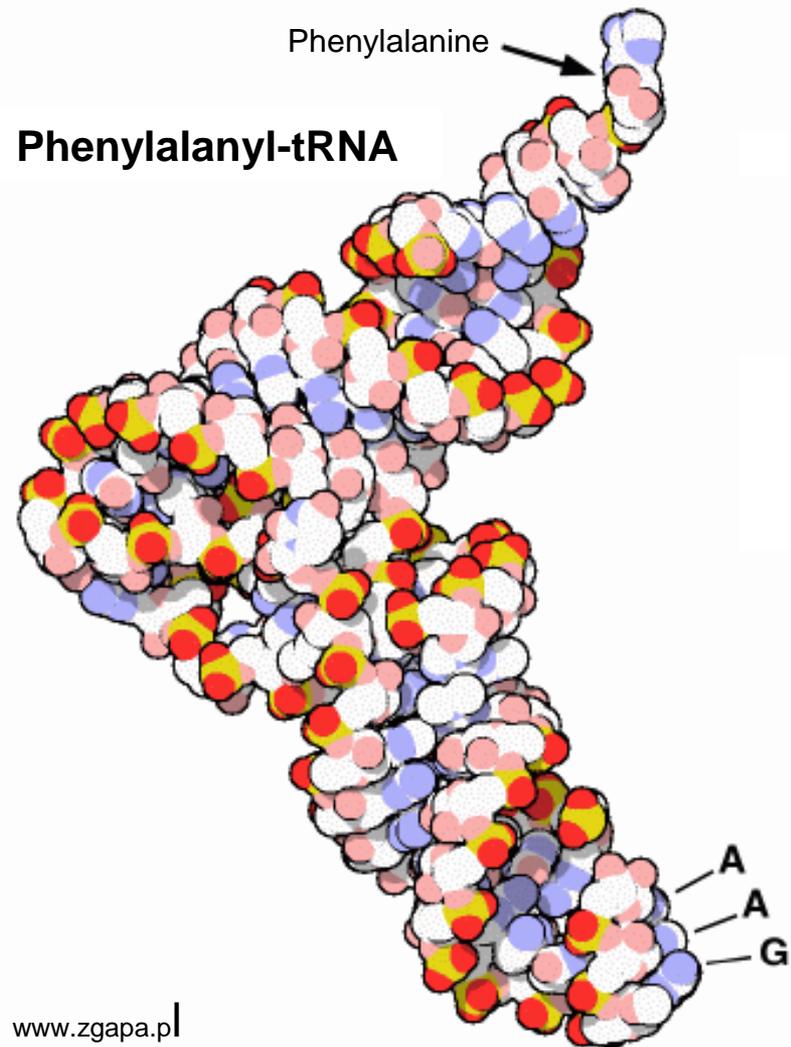
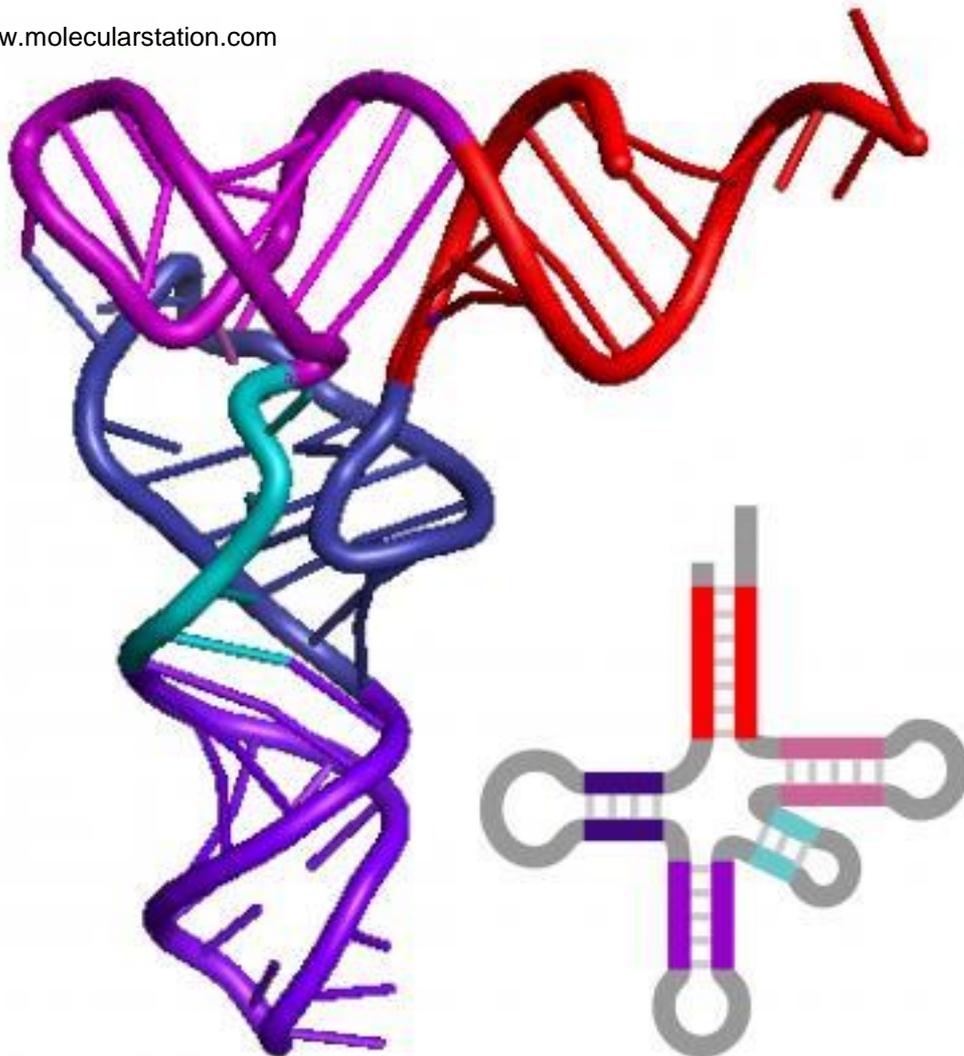


- amino acid+ tRNA → aminoacyl-tRNA
- ATP is required
- (aminoacyl- or peptidyl-) tRNA connects to the ribosome: (P-site and A-site, also E-site)
- Peptidyl- tRNA: tRNA binds a peptide or polypeptide

Translation: the participants of protein synthesis

- tRNA

www.molecularstation.com

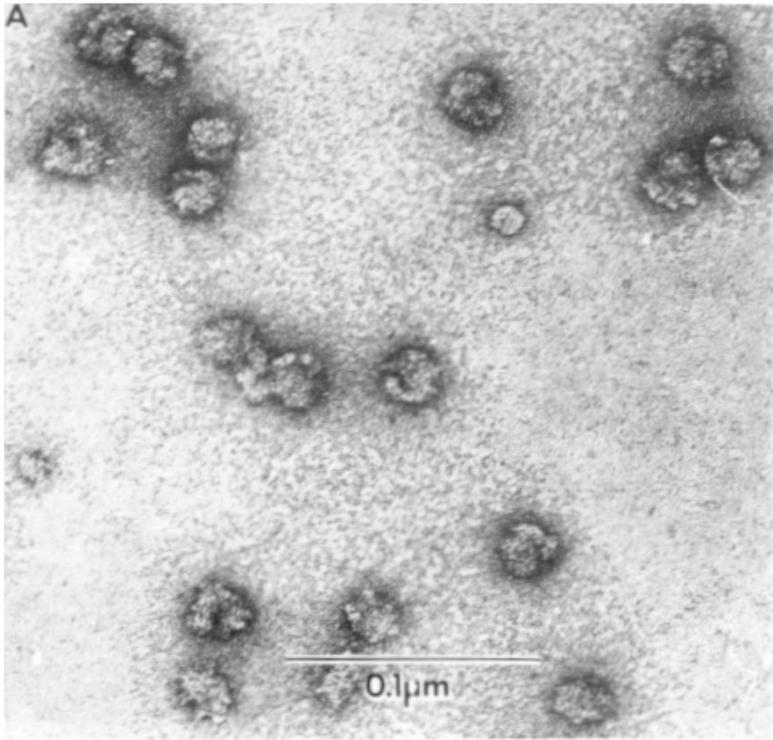


www.zgapa.pl

Translation: the participants of protein synthesis

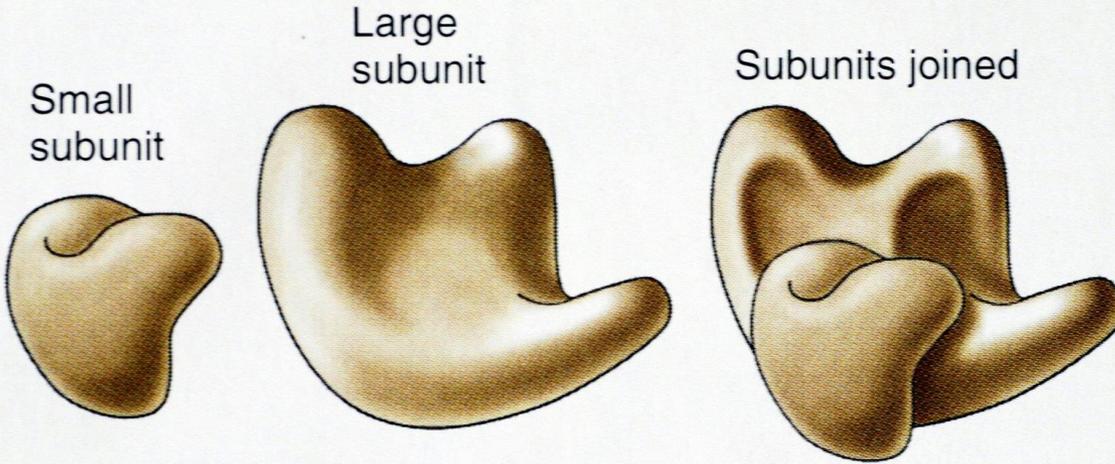
- ribosome: has 2 subunits (small and large)

- Composed of rRNA and proteins
- Able to bind mRNA, tRNA
- Can be free in the cytoplasm or bound to the surface of the rough endoplasmic reticulum
- The ribosome creates the peptide bonds between the amino acids

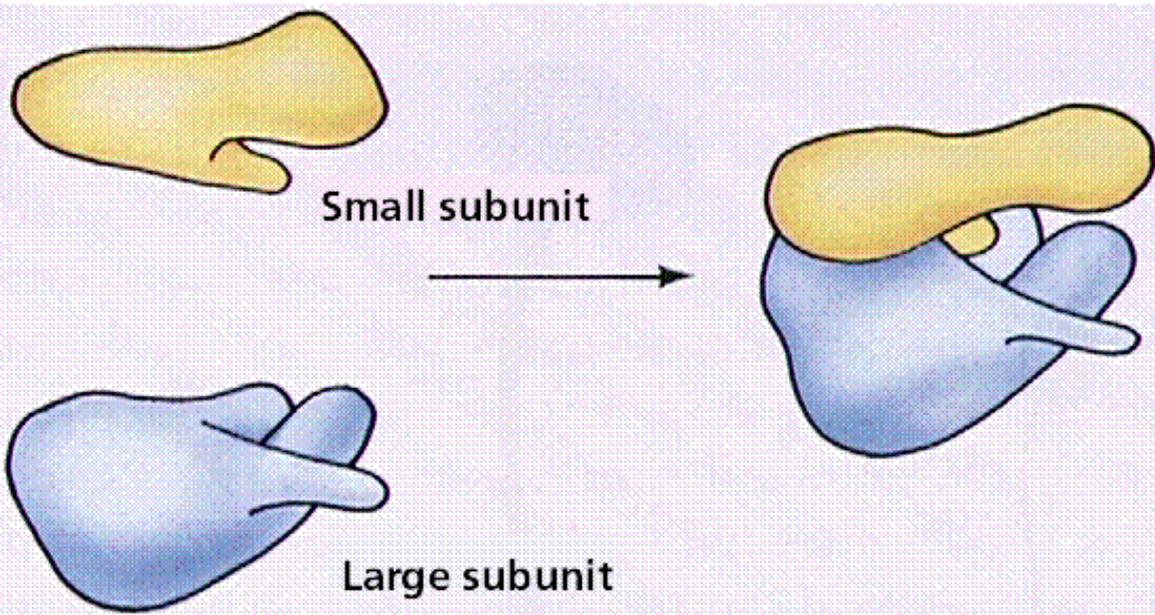


Electron microscopic image

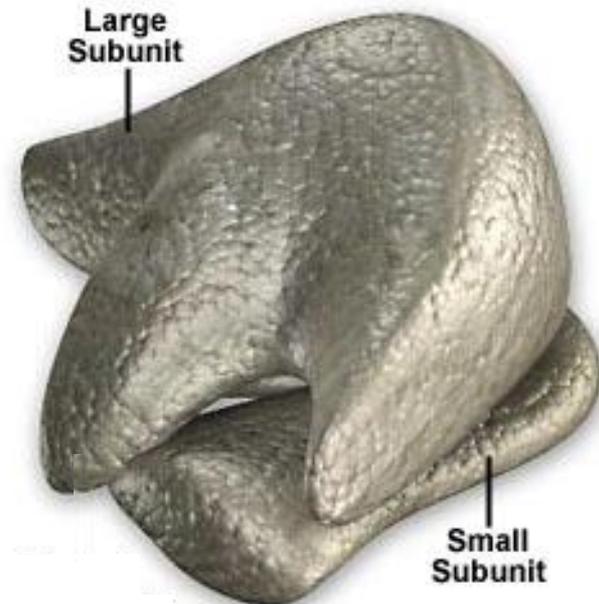
Ribosomes



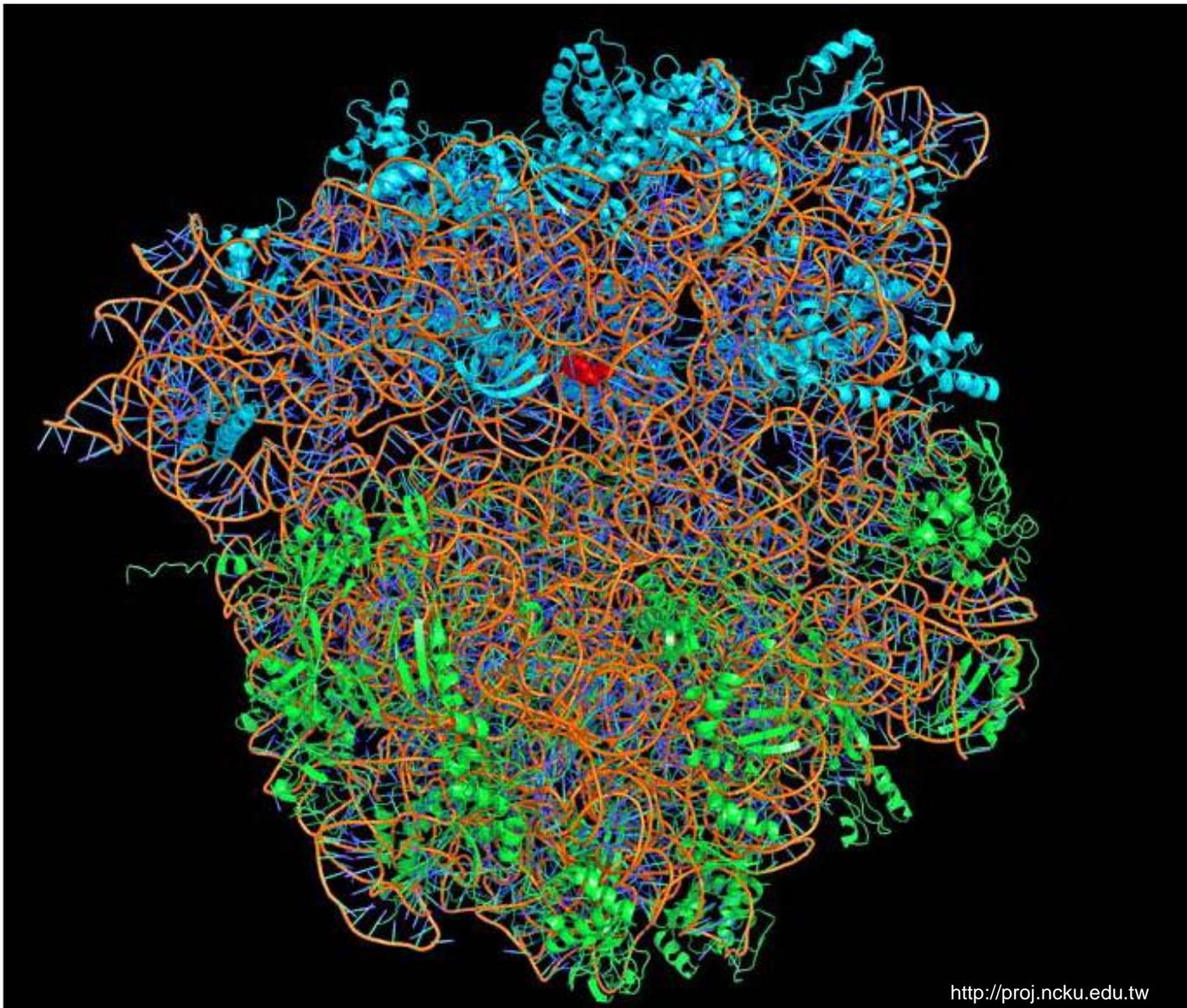
www.lh6.ggph.com



www.emc.maricopa.edu

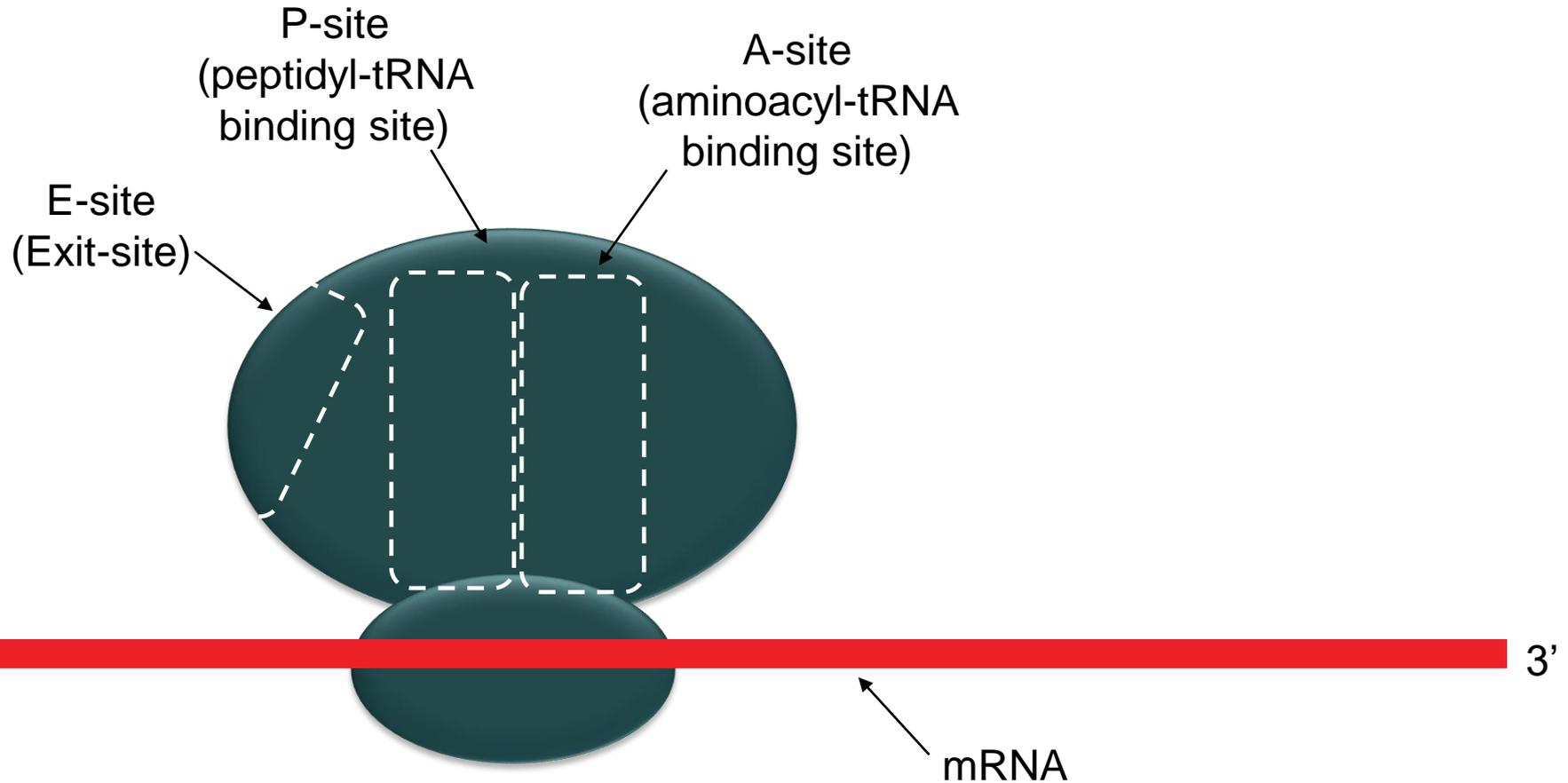


www.cartage.org



ribosome

tRNA binding sites on the ribosome

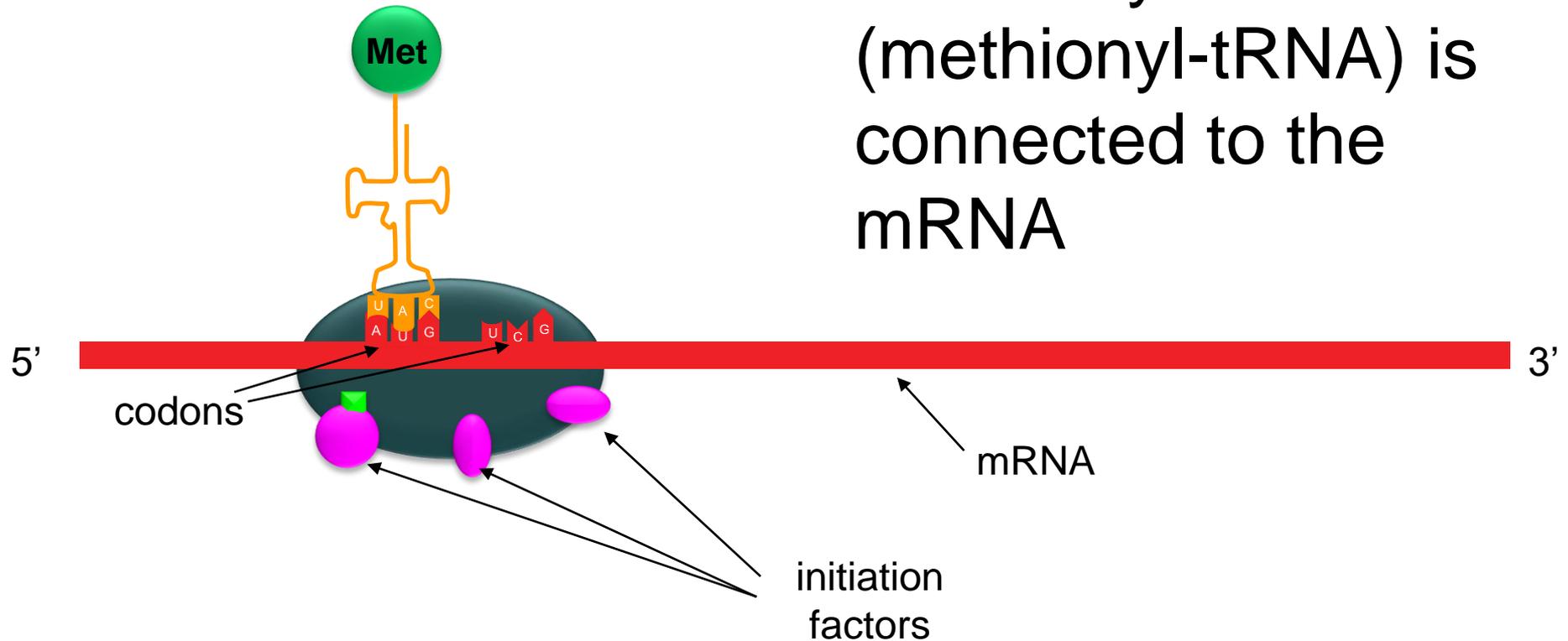


Translation: the mechanism of protein synthesis

- 3 phases:
 1. initiation
 2. elongation (repeated cycles with 3 steps each)
 3. termination

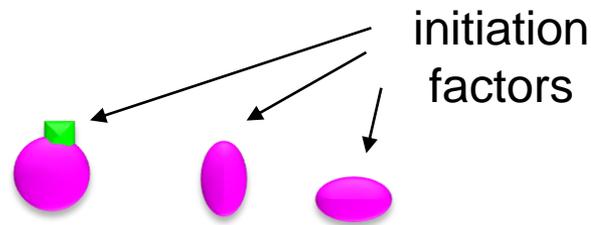
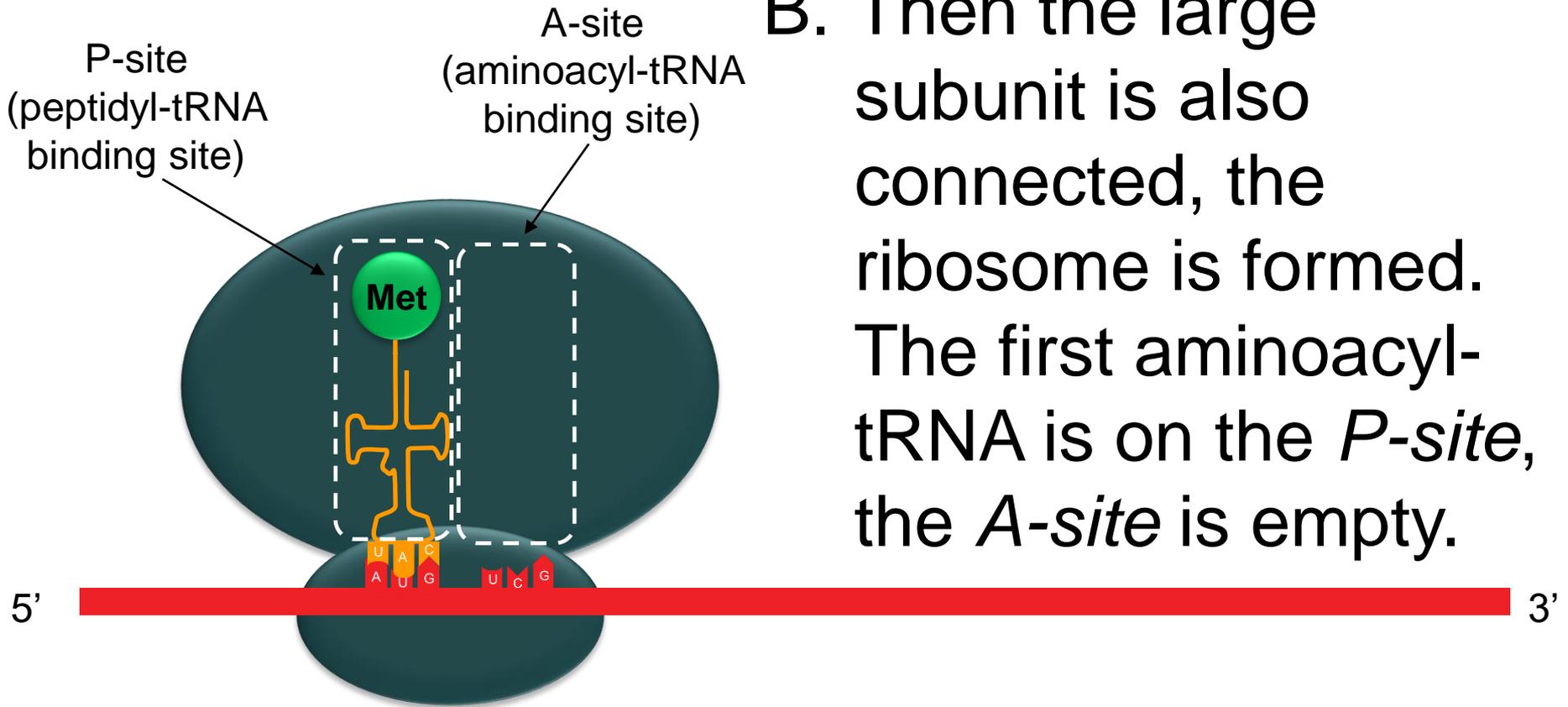
Initiation

A. The small subunit and the first aminoacyl-tRNA (methionyl-tRNA) is connected to the mRNA



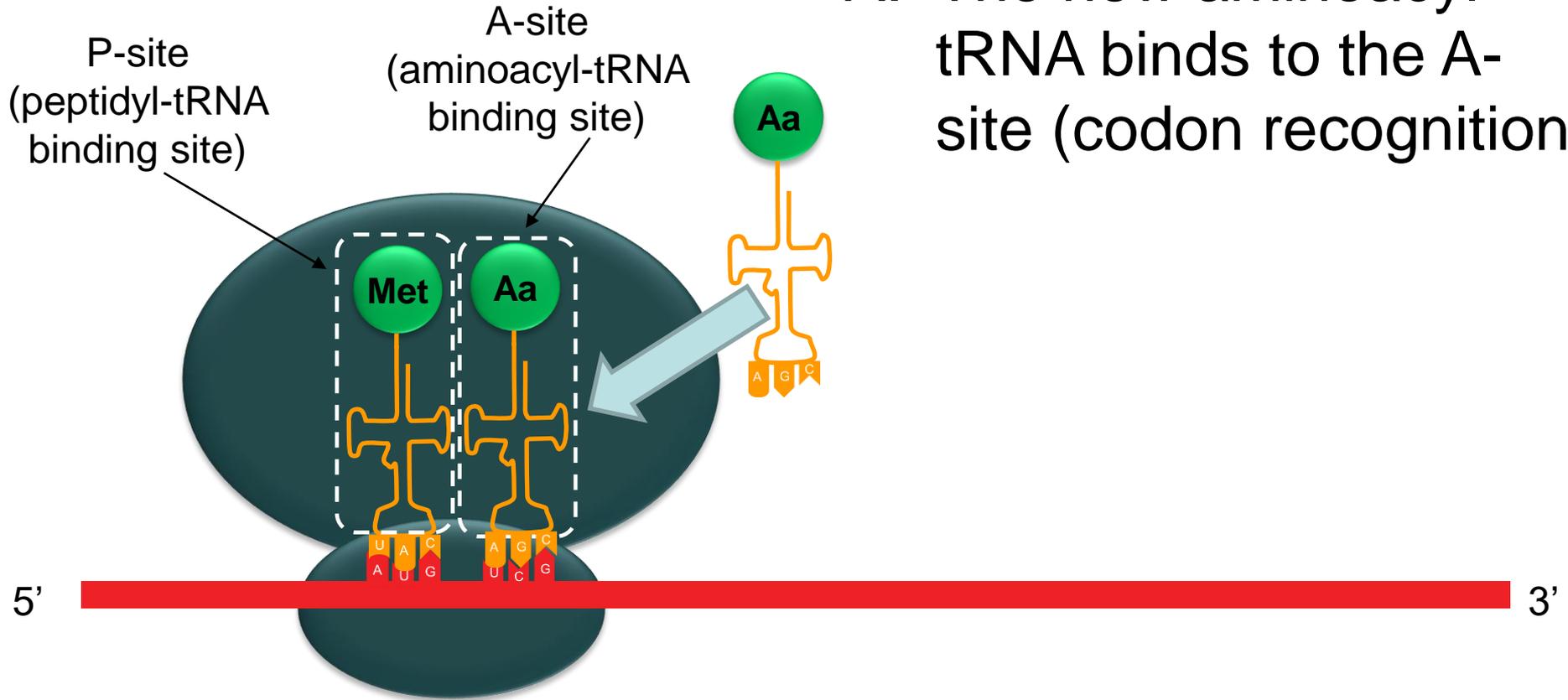
Initiation

B. Then the large subunit is also connected, the ribosome is formed. The first aminoacyl-tRNA is on the *P-site*, the *A-site* is empty.

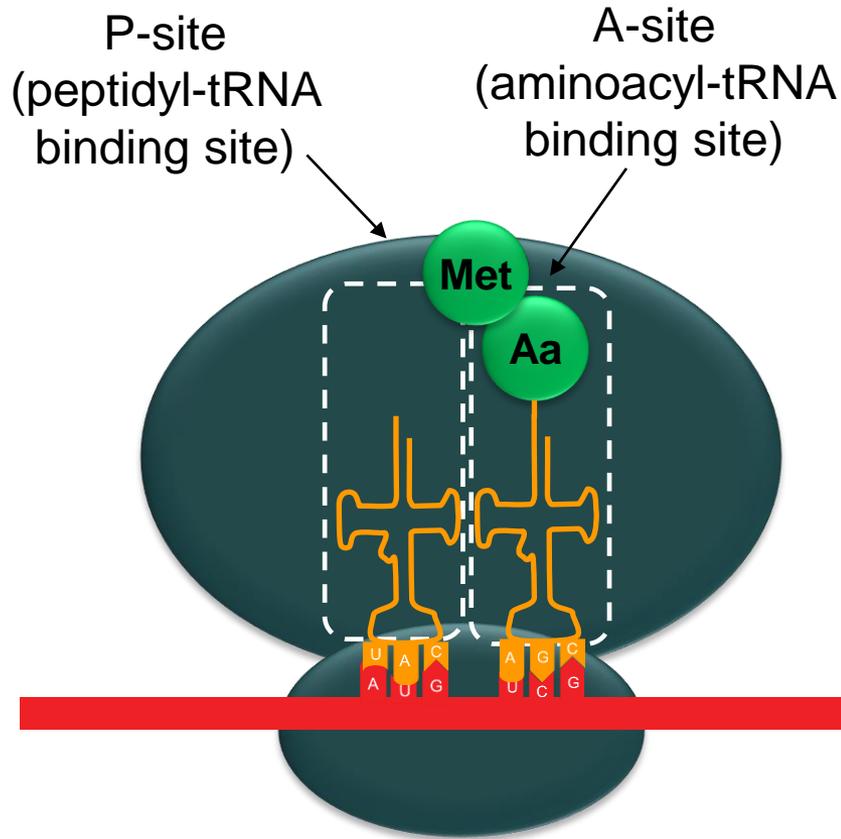


Elongation

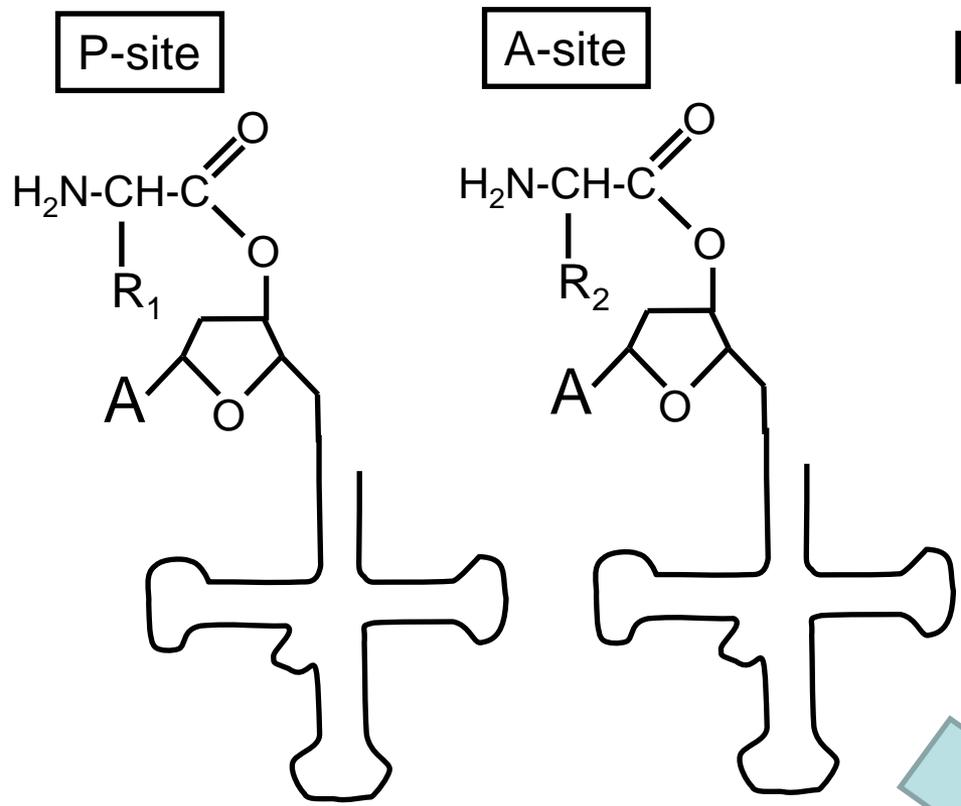
A. The new aminoacyl-tRNA binds to the A-site (codon recognition)



Elongation

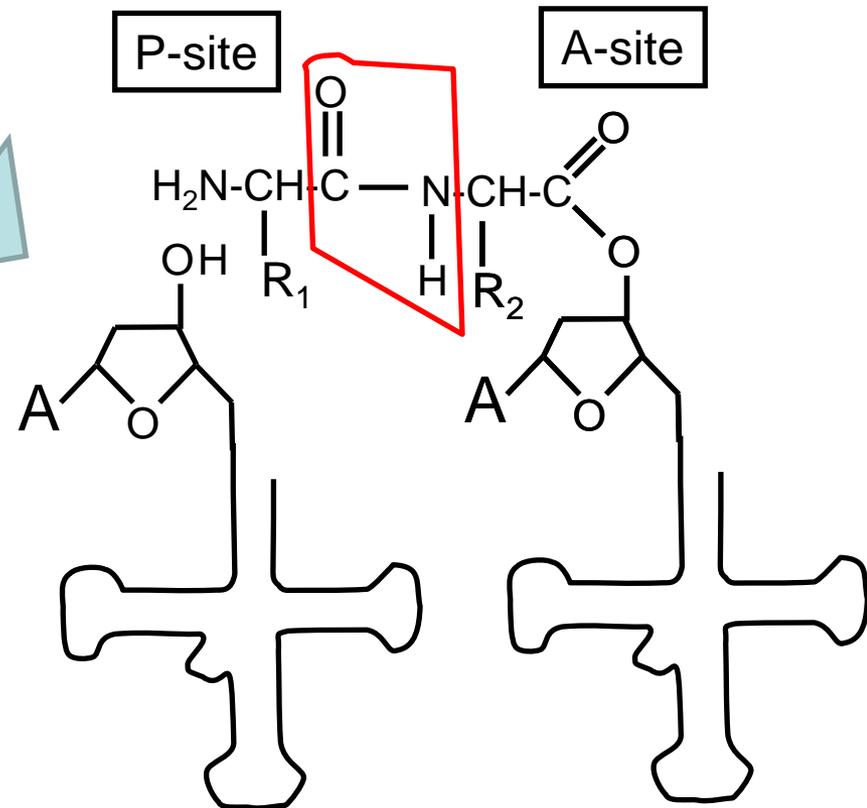


- B. The peptide bond is formed (because the ester bond between the tRNA and the amino acid is cleaved on the P-site)



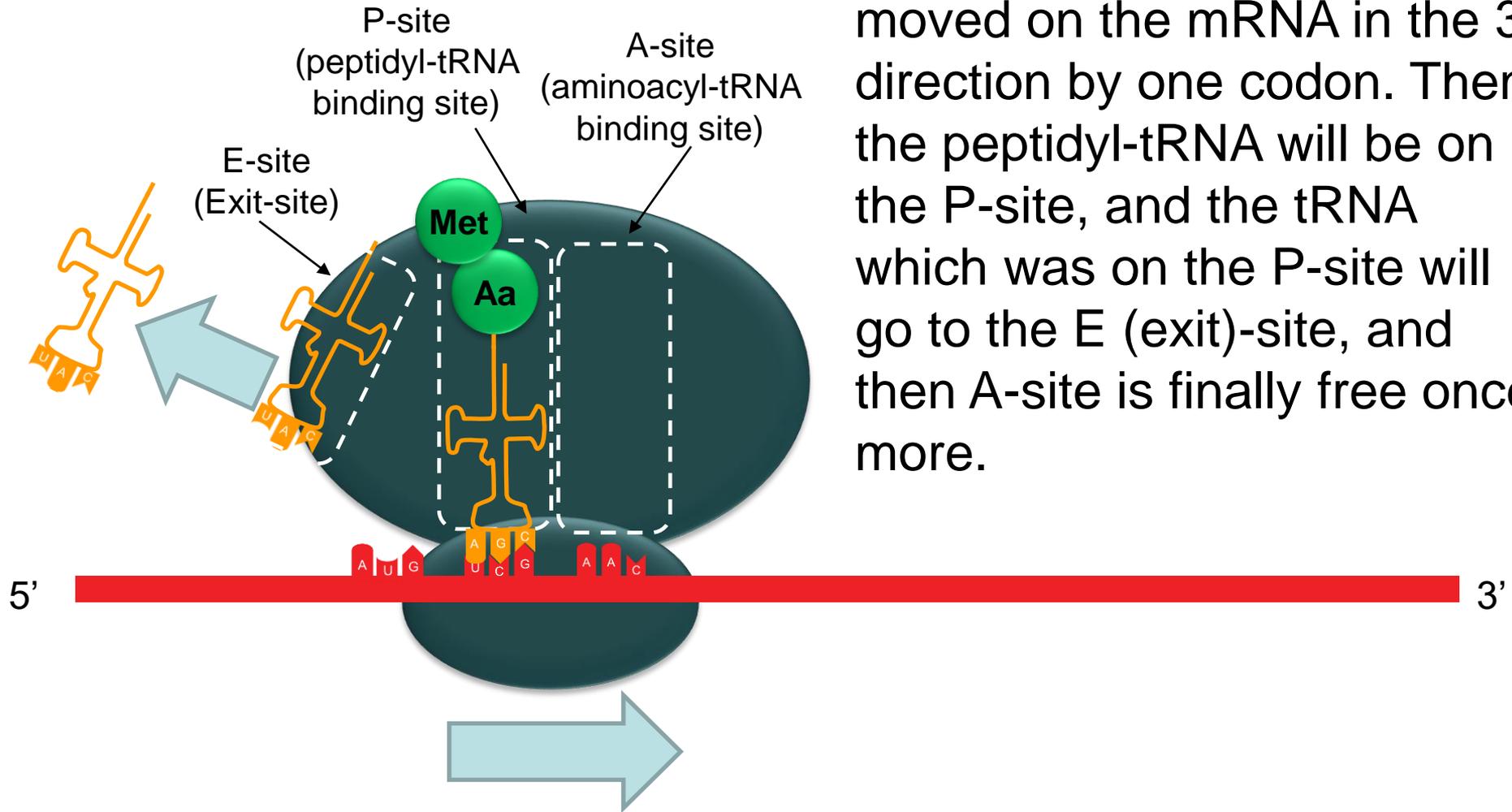
B. The peptide bond is formed (because the ester bond between the tRNA and the amino acid is cleaved on the P-site)

The reaction is catalysed by the peptidyl transferase



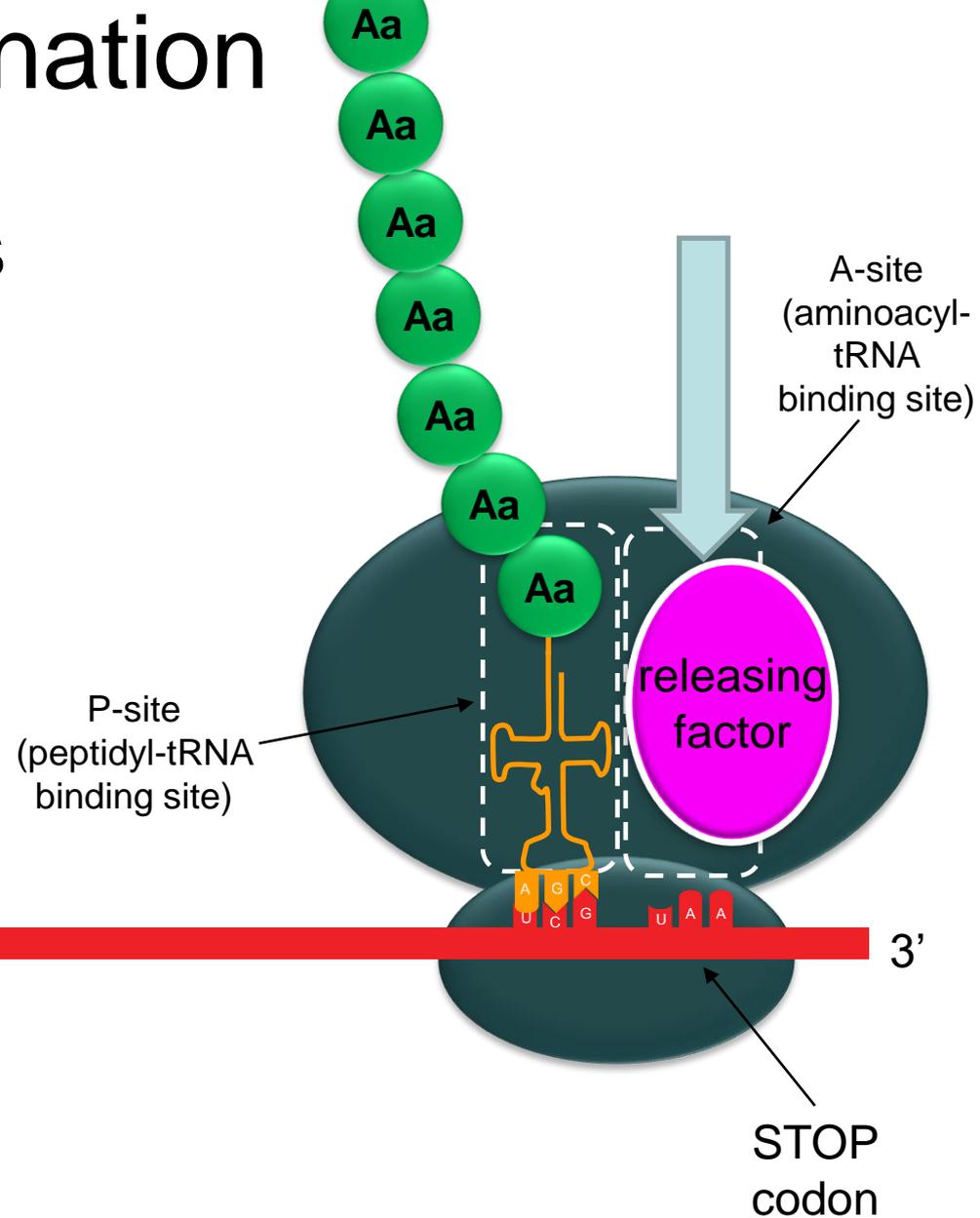
Elongation

- C. Translocation: the ribosome is moved on the mRNA in the 3' direction by one codon. Then the peptidyl-tRNA will be on the P-site, and the tRNA which was on the P-site will go to the E (exit)-site, and then A-site is finally free once more.



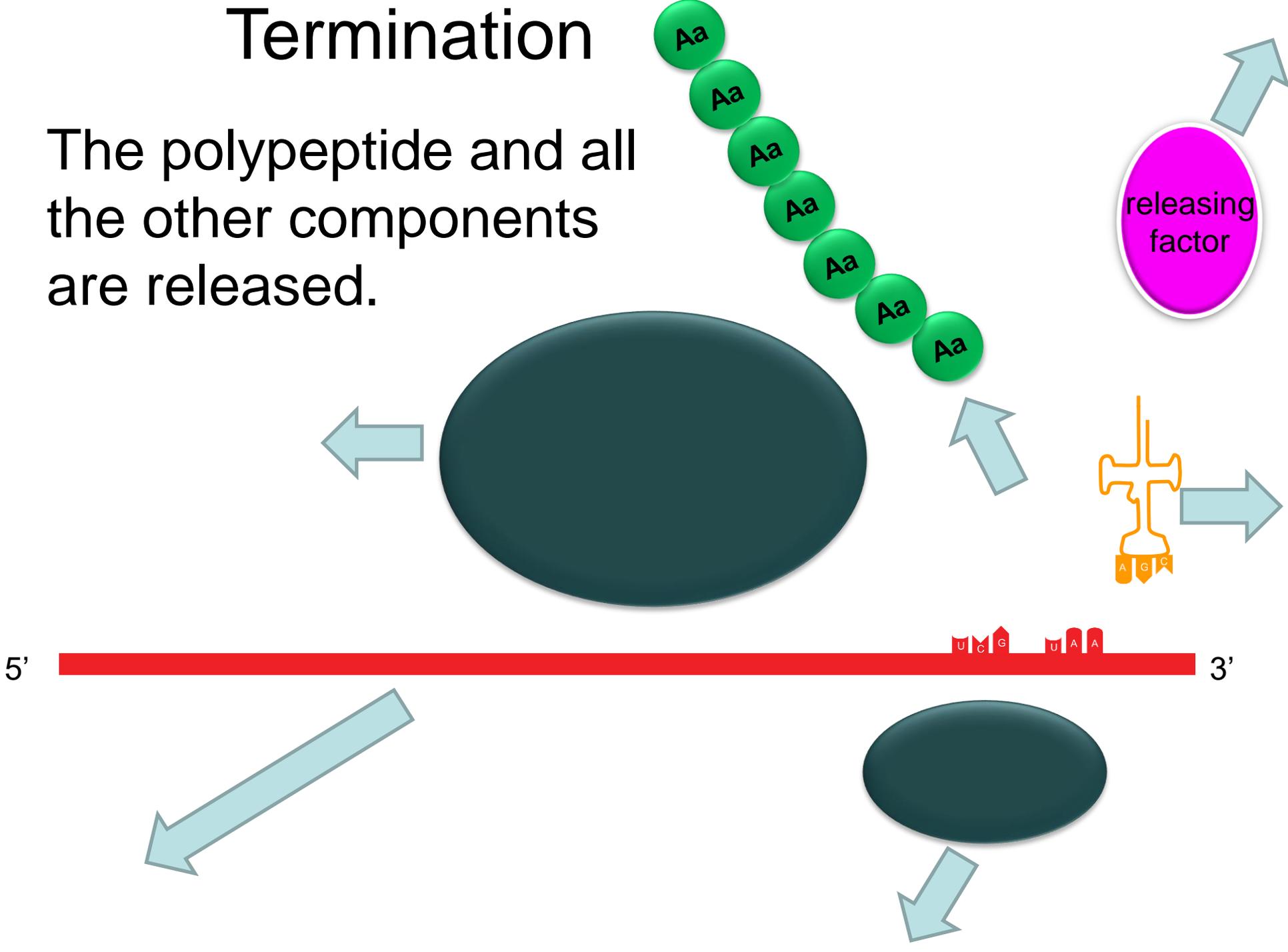
Termination

When the stop codon is at the A-site, no tRNA can bind. A releasing factor is connected there instead, and it activates the peptidyl transferase.

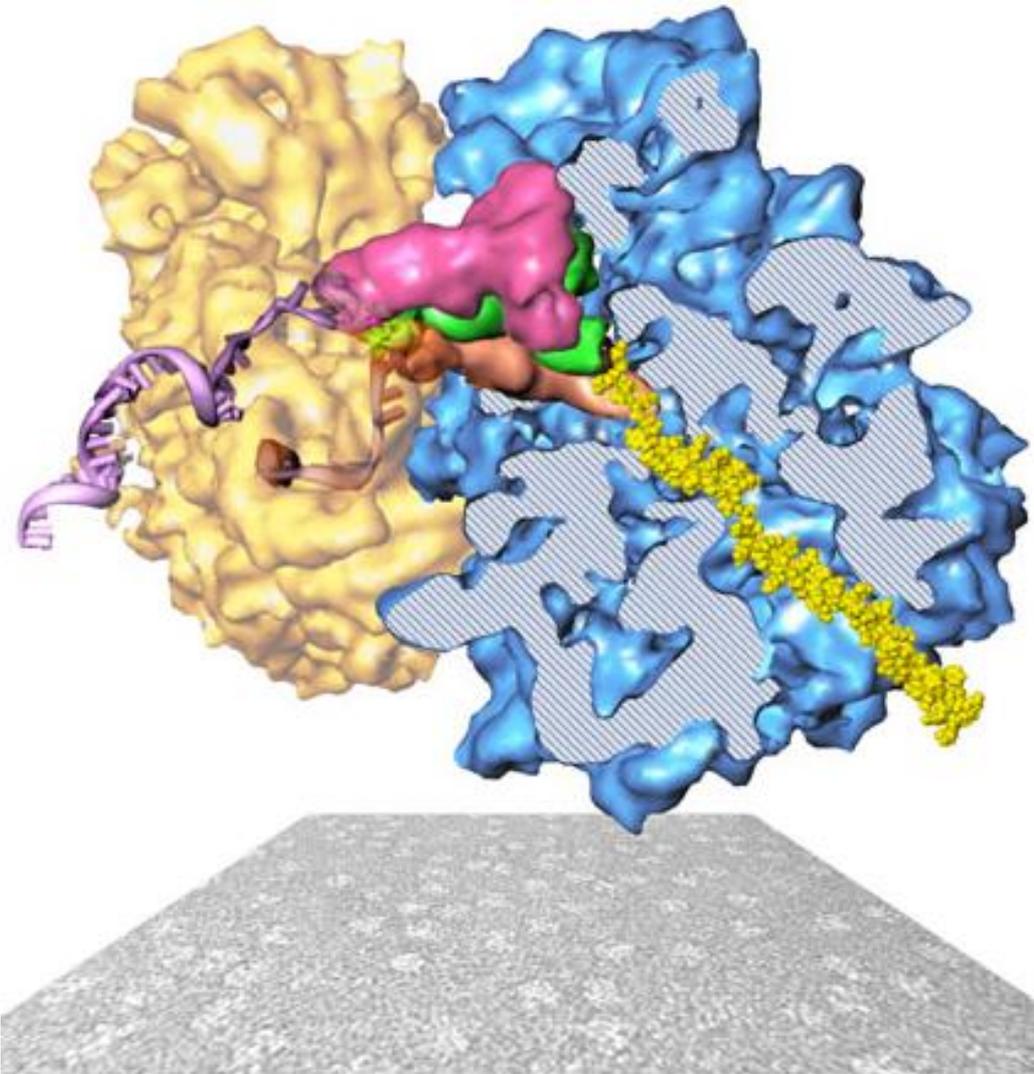
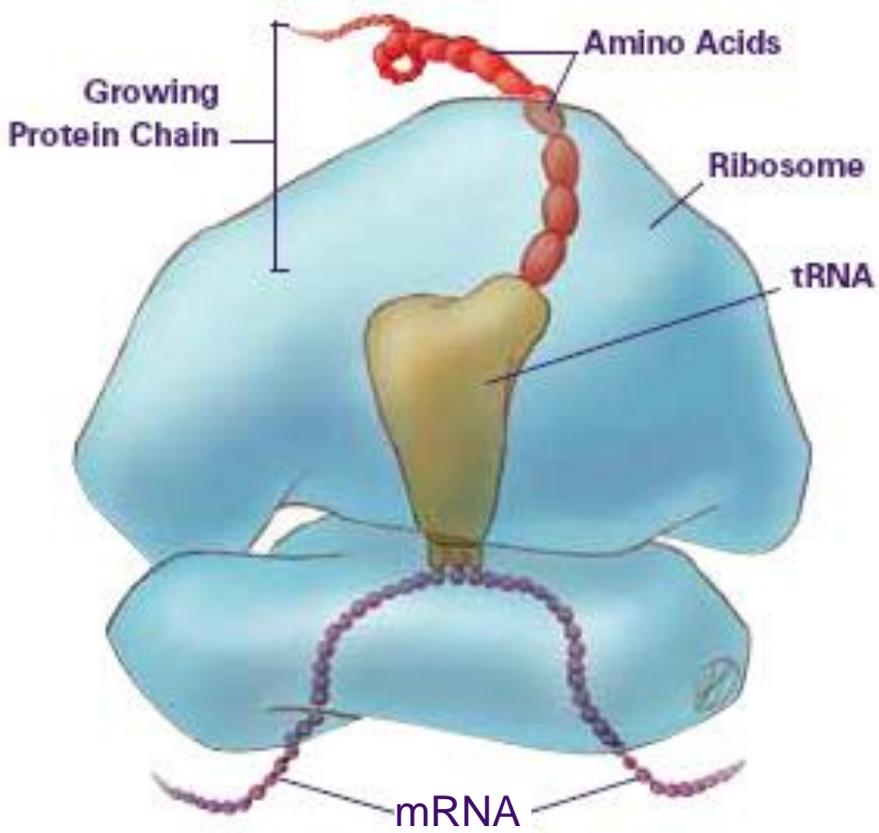


Termination

The polypeptide and all the other components are released.



3D structure



<http://publications.nigms.nih.gov>

[www_wadsworth.org_joachim_frank.jpg](http://www.wadsworth.org_joachim_frank.jpg)

Polysomes

- Polysome = polyribosome = mRNA + the ribosomes on it
- It is the location and clear sign of translation

