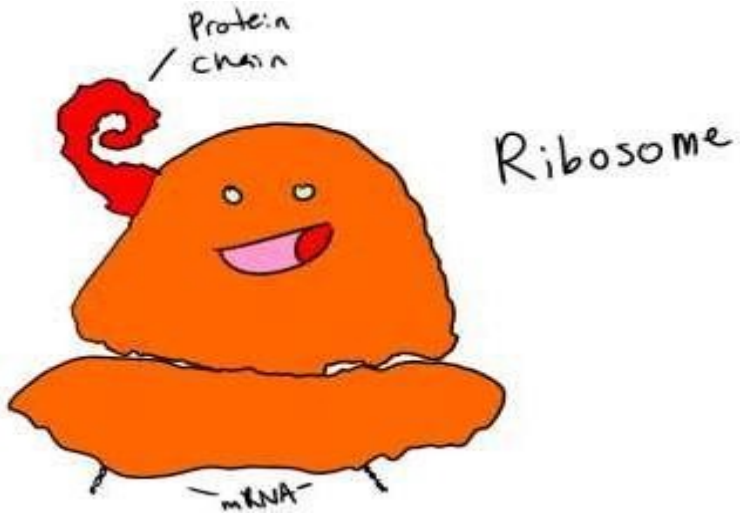
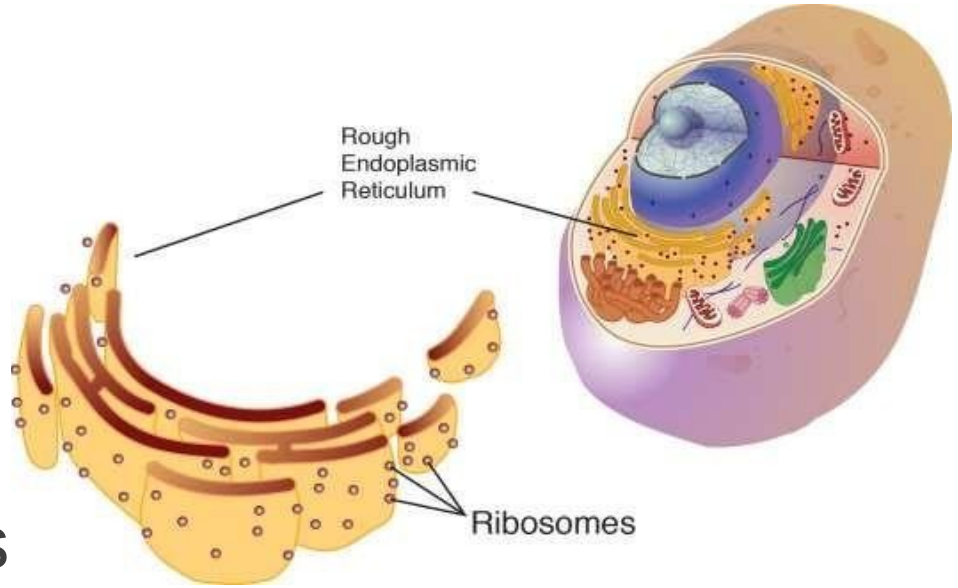
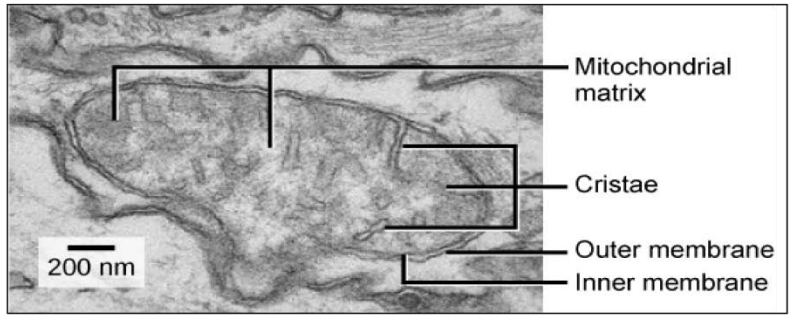
Introduction

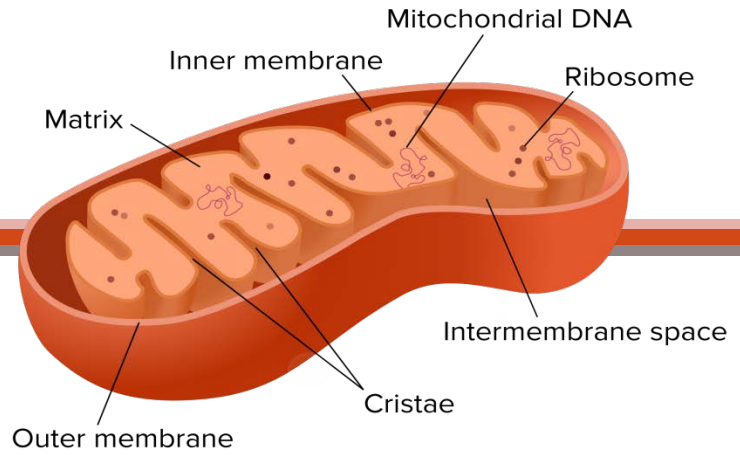


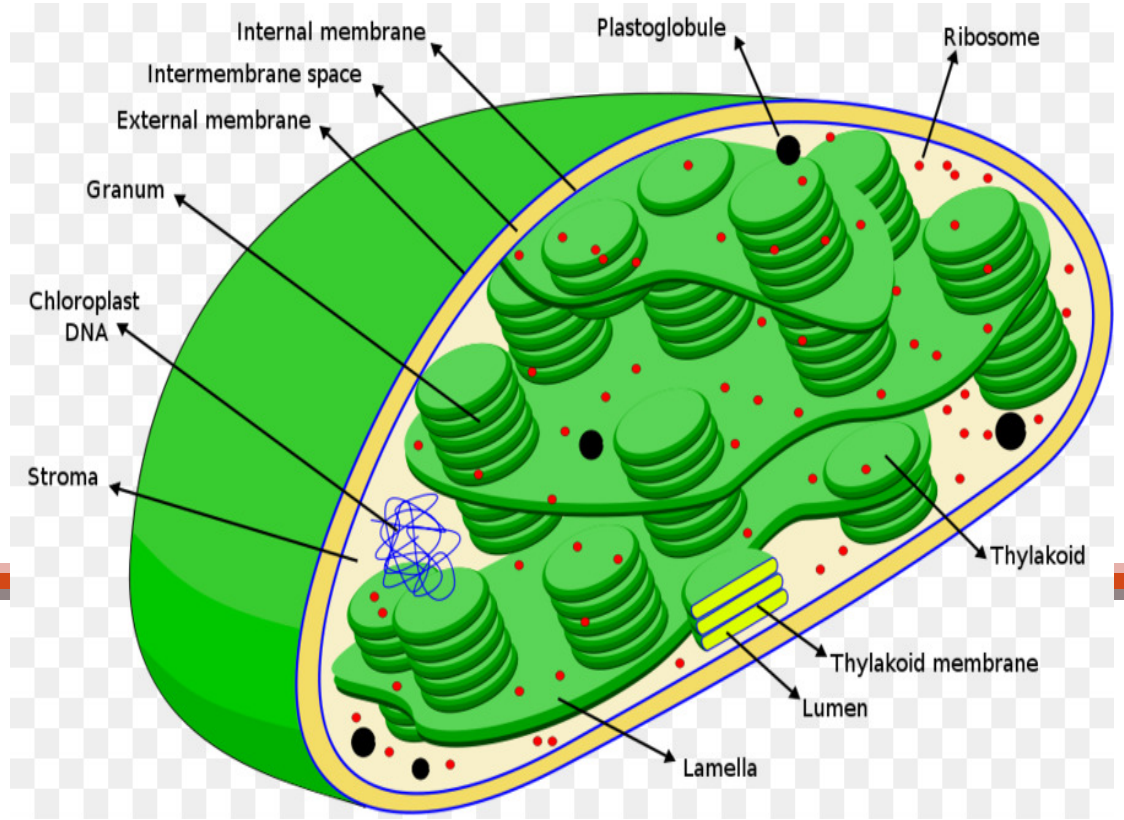
- Cell's factory; site for protein synthesis (Translation)
- Also know as Translational Apparatus
- Non-membranous organelle
- Mostly attached to Rough ER
- Also found free
- Made up of rRNA and ribosomal proteins



- More active cell contain more number of ribosomes
- Ribosomes also present in mitochondria and chloroplast of eukaryotic cells







https://upload.wikimedia.org/wikipedia/commons/d/d2/organells_structure.svg

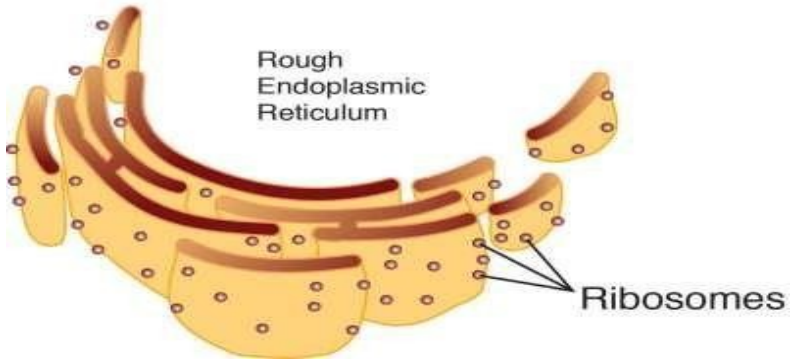
History

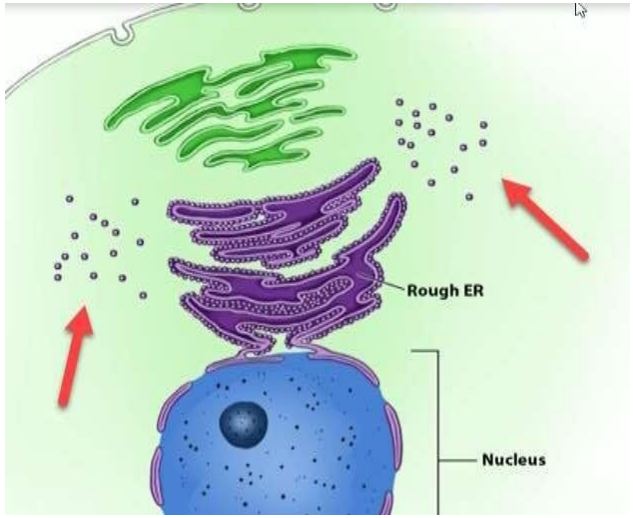
- First observed during mid 1950s by George Emil Palade
- By electron microscope as dense particles
- First named Microsomal Particles
- Its detailed structure was discovered in 2000 and 2001

Types of Ribosome

- Classified according to their location-
- Membrane-Bound Ribosomes

  Synthesize proteins for membranesand exocytosis (Used outside the cell)
  - Attached to ER and other organelles





www.wikipedia.com

- Free Ribosomes
  - Found freely in cytoplasm (Red arrows)
  - Synthesize proteins that function inside the cytosol (Used inside the cell e.g. food metabolism)

Structure of Ribosomes

- Made up of rRNAs and distinct Ribosomal Proteins
- Made up of two sub-units
  - In prokaryote- (70S)

30S subunit : 16S rRNA molecule + 21 different proteins.

50S subunit : 5S rRNA, 23S rRNA + 31 different proteins.

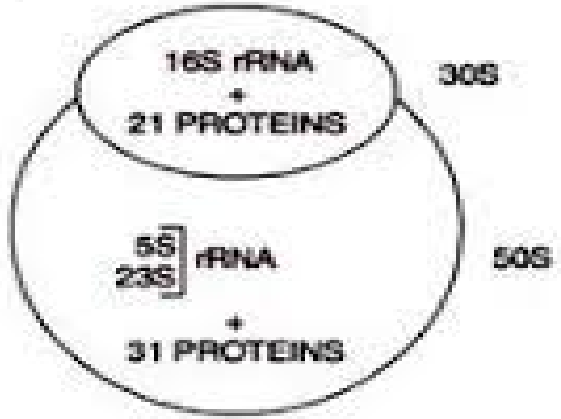


Fig. 13.2. 70S Ribosome

  - In eukaryote- (80S)

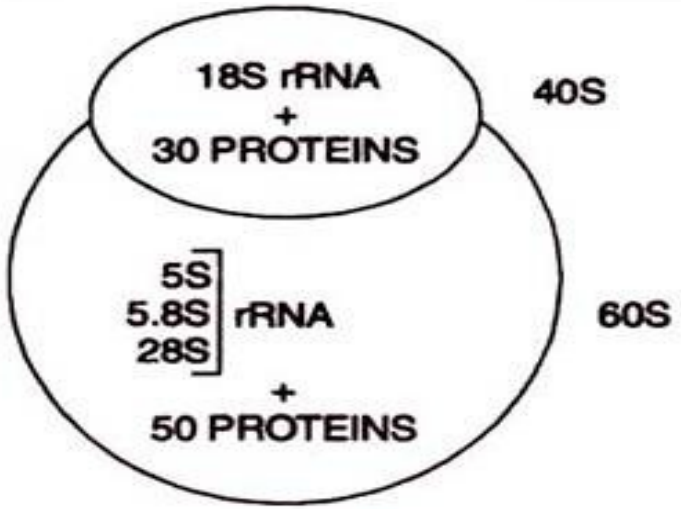


Fig. 13.3. 80S ribosome

http://www.biologydiscussion.com/proteins/protein-synthesis/role-of-ribosomes-in-protein-synthesis-with-diagram

Prokaryotic vs Eukaryotic Ribosome

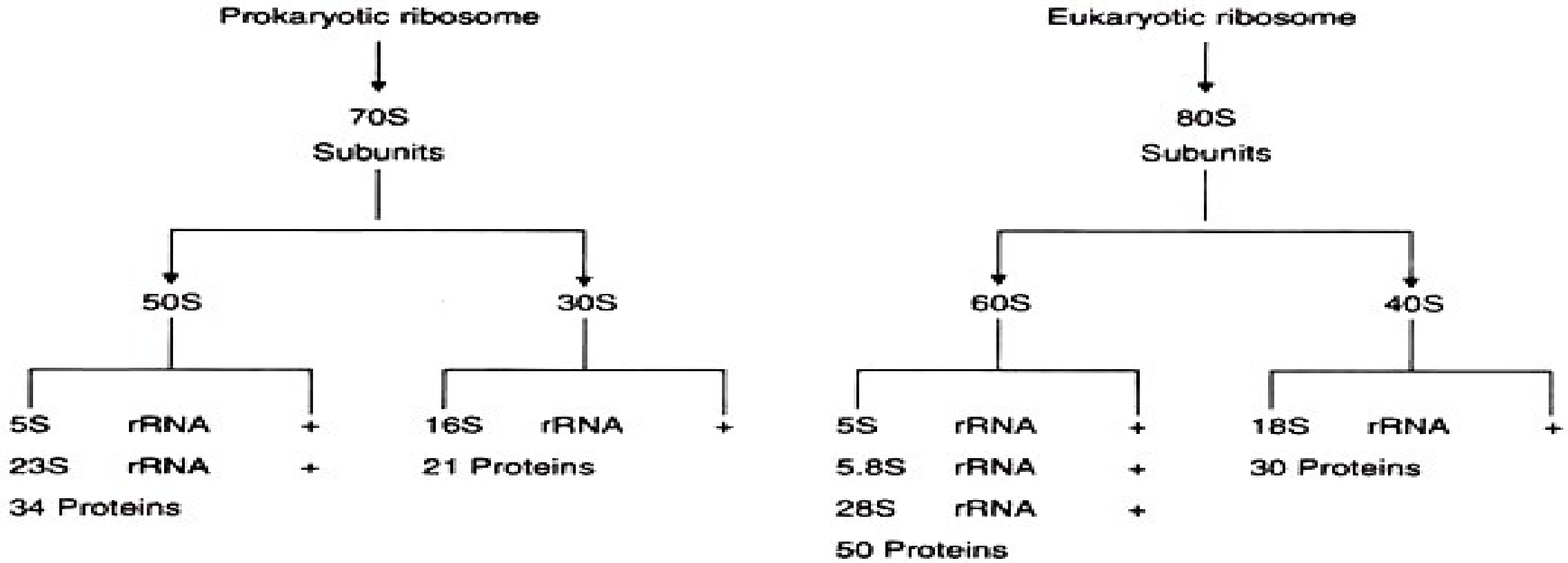


Fig. 15.18 Comparison between prokaryotic and eukaryotic ribosomes.

http://www.biologydiscussion.com/ribosome/structure-of-subunits-of-ribosomes-with-diagram-genetic

Continue...

- Here S- represents the svedberg's unit or sedimentation co-efficient
- Eukaryotic ribosomes are larger and sediment at 80S- 40S+60S

- Prokaryotic ribosomes are smaller and sediment at 70S- 50S+30S

Constituents of Ribosomes

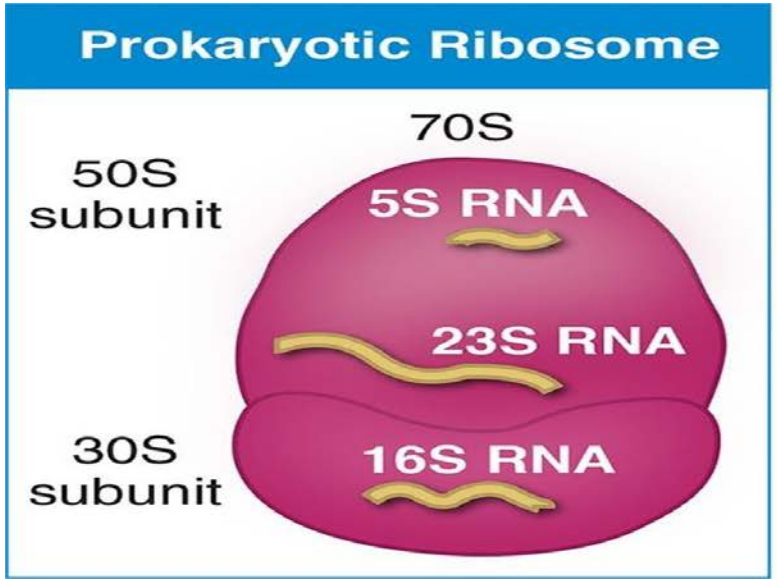
- Made up of rRNA and protein
- More than 40-70 rProtein present

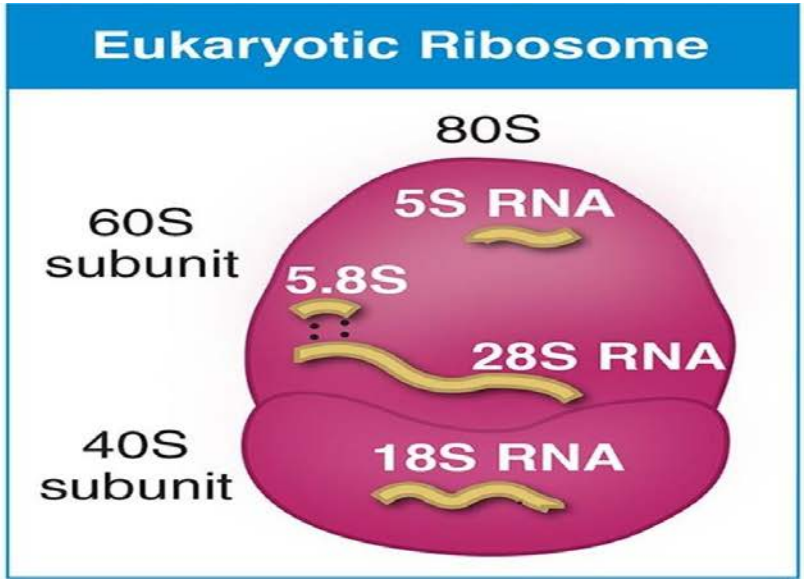
rRna

- rRNA has ribozyme activity (Peptidyl transferase) i.e. it catalyzes the peptide bond formation with the help of ribosomal proteins
- In prokaryote-there are 3 rRNA present
  - 16S rRNA- found in smaller sub-units i.e. 30S
  - 23S and 5S- present in larger sub-units i.e. 50S

- **In eukaryote-** 4rRNA are present
- 18S present in smaller subunit i.e. 40S
- 28S, 5.8s and 5S- present in larger sub units i.e. 60S

Ribosome has 2- subunit





- https://www.quora.com/What-are-70S-ribosomes#

Large Subunit

- Contains the active site of ribosome
- The site where new peptide bonds are formed
- Contains Aminoacyl binding site
- Contains Peptidyl binding site
- E-site for exit
- It uses peptidyl transferase to catalyze the process
- Made of two rRNA
- And many protein

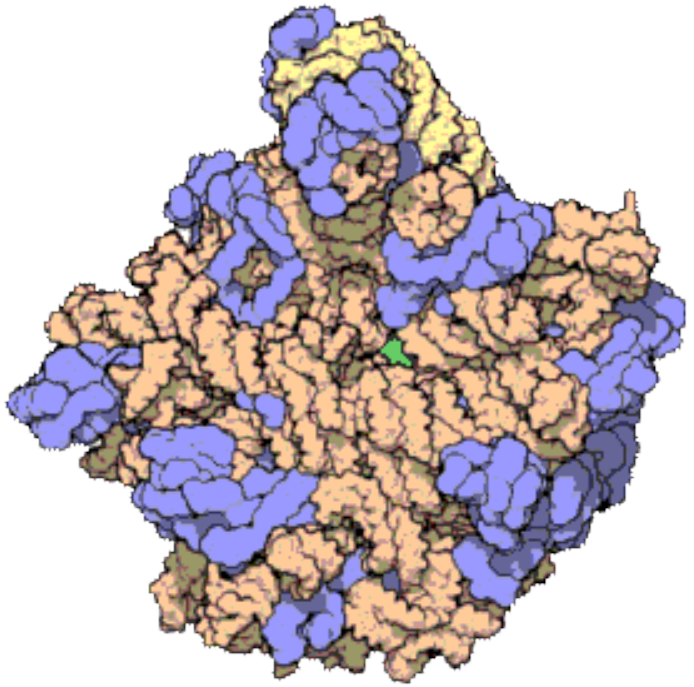
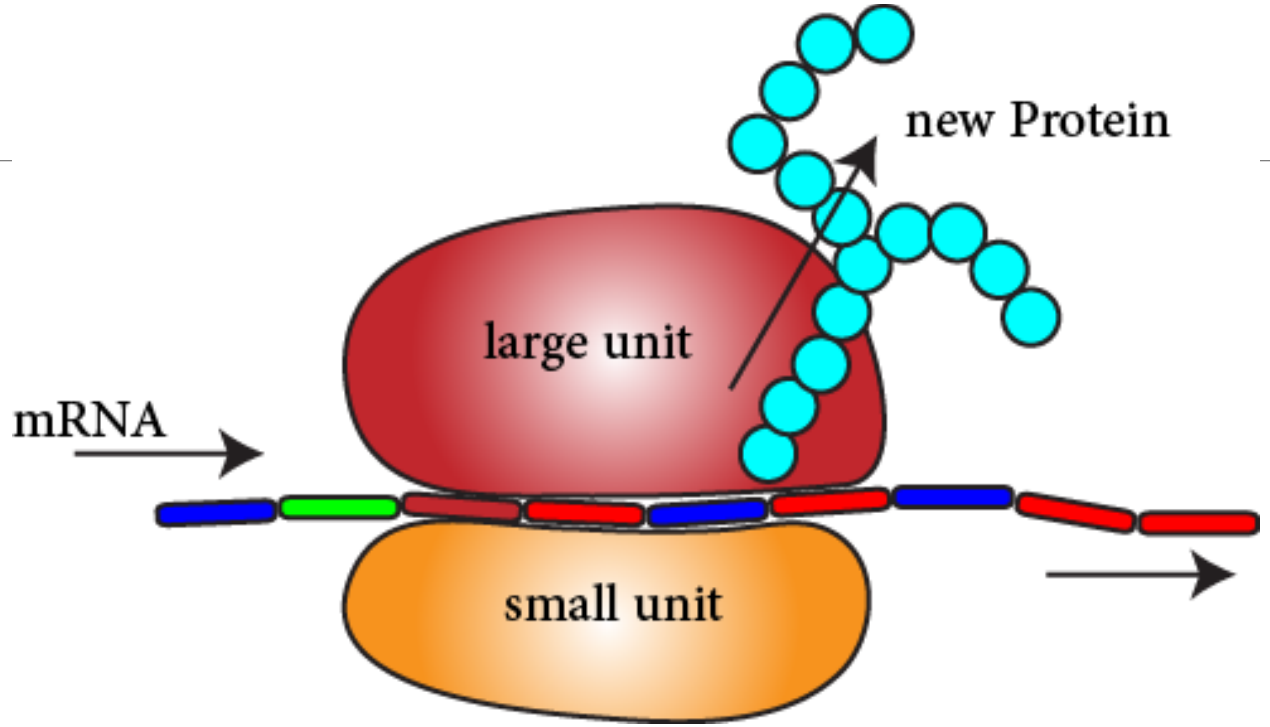


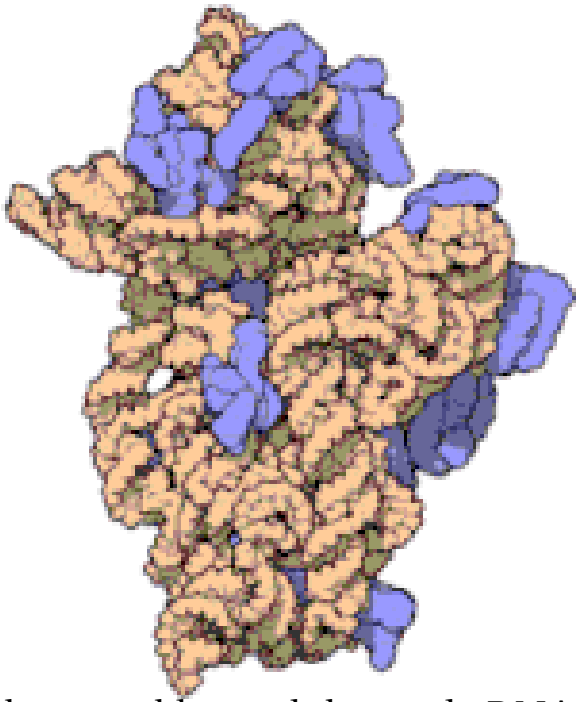
figure 4: Atomic structure of the 50S subunit from *Haloarcula marismortui*. Proteins are shown in blue and the two RNA chains in brown and yellow.[30] The small patch of green in the center of the subunit is the active site.
https://en.wikipedia.org/wiki/Ribosome



https://teachmephysiology.com/basics/protein-synthesis/dna-translation/

Small Subunit

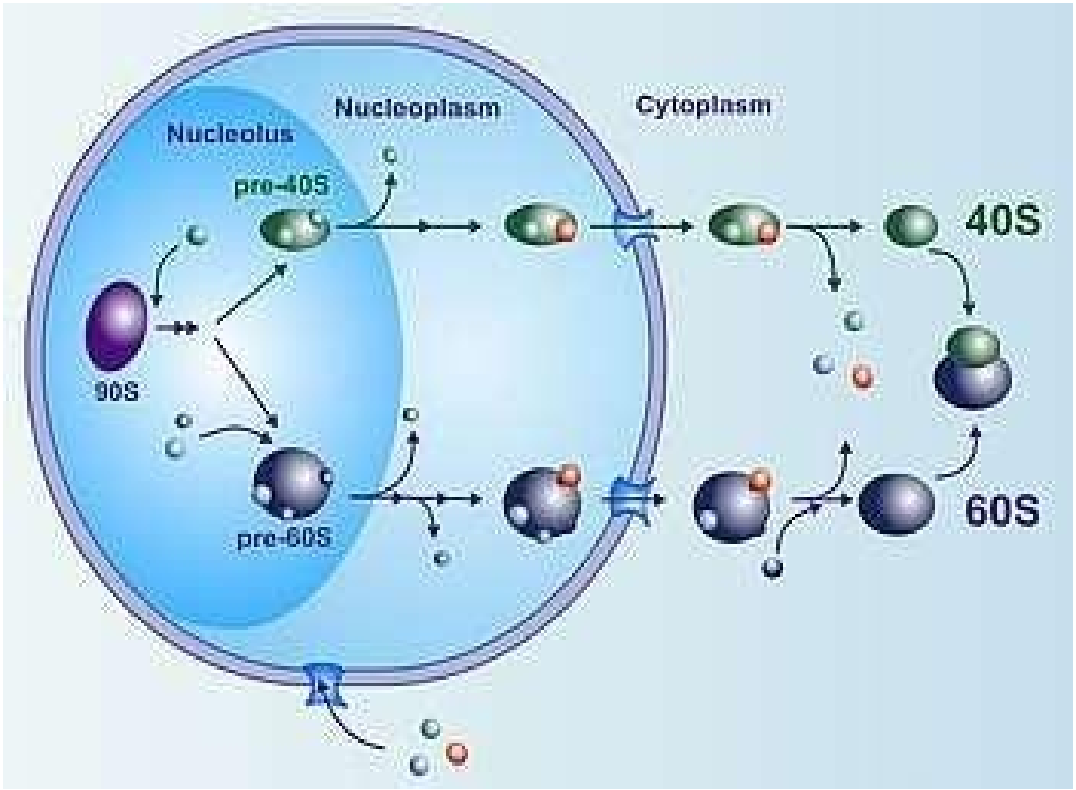
- Made up of 16S rRNA
- And 19 rProtein
- In charge of information flow
- Intake of mRNA
- Pairing codons with anti-codons
- Scan the mRNA for start codon (5')-AUG-(3') to initiating the translation
- Contain entry and exit site for mRNA



Proteins are shown in blue and the single RNA chain in brown
https://www.philpoteducation.com/mod/book/tool/print/index.php?id=802&chapterid=1073

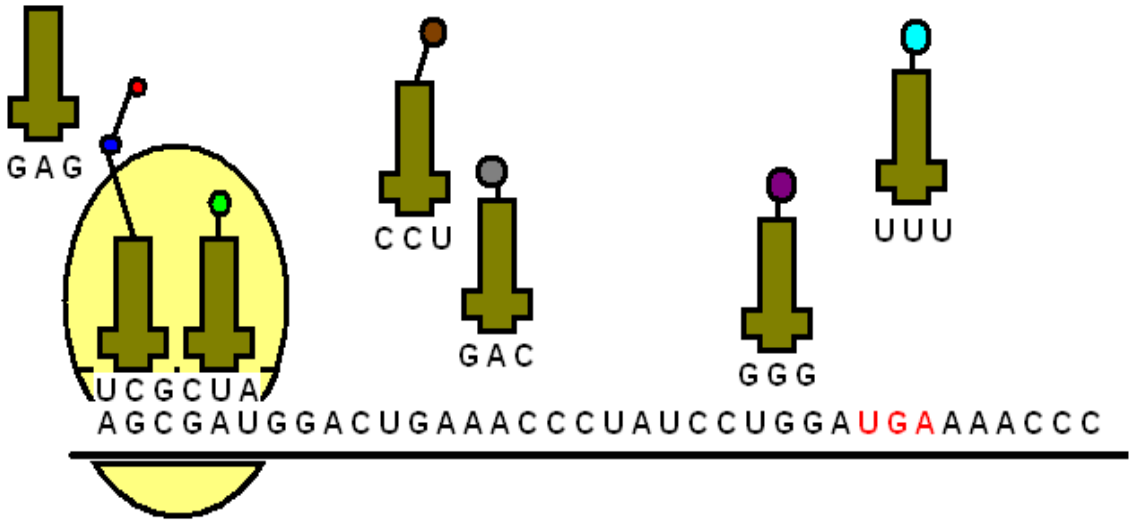
Ribosome Biogenesis

- It is the process of making Ribosomes in thet nucleus
- The protein parts are made in the cytoplasm (Ribosome)
- Then transferred to the nucleus (Nuclear Pores)
- rRNAs are transcribed in the nucleolus
- The ribosomal proteins and rRNAs bind together
- Small and large subunits are made
- They are transported out of nucleus (Pores)



Function

- The one and only function is Protein Synthesis
- This process is called Translation
- Begins with transcription of mRNA in the nucleus
- mRNA travels to the cytoplasm with specific codes
- It binds with the small subunit of the ribosome
- The two subunits come together



https://www.khanacademy.org/science/biology/gene-expression-central-dogma/translation-polypeptides/a/the-stages-of-translation

Common Disorders

- Most of the disorders associated with ribosome have abnormal biogenesis
- It is the abnormal formation of ribosomes
- Mostly they get destroyed but they escape in rare cases
- Some major diseases caused by abnormal ribosome;
  - Diamond-Blackfan anemia
  - Cartilage-hair hypoplasia

https://www.khanacademy.org/science/biology/ribosomal

Keep your factory safe

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Thank You!