

# **RIBOSOMES STRUCTURE & FUNCTIONS**

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**First isolated from cell cytoplasm by A.Claude(1943)**

**Term ribosomes was coined by G.Palade(1955).**

**Also called 'palade particles'**

**Found in both prokaryotes & eukaryotes( except sperm & RBC)**

**Reported inside the matrix of mitochondria & plastids also.**

**No. of ribosomes depend upon the RNA contents & basophilic nature of the cell.**

**Sites of protein synthesis so called protein factories.**

# Types :

**On the basis of sedimentation coefficient, ribosomes are of 2 types:**

**(A ) 70S Ribosomes:**

**Found in prokaryotes.**

**(B)80S Ribosomes:**

**Found in cytoplasm of eukaryotes.**

## **Ultrastructure of 70S Ribosome:**

- Ribosome is a naked body.**
- Formed of larger 50S & smaller 30S subunits.**

**50S** :Dome shaped,140-160A in size.

- Formed of a central protuberance,a ridge & a stalk.**
- A valley between central protuberance & ridge.**
- It has 2 binding sites peptidyl or P& Aminoacyl orA site.**

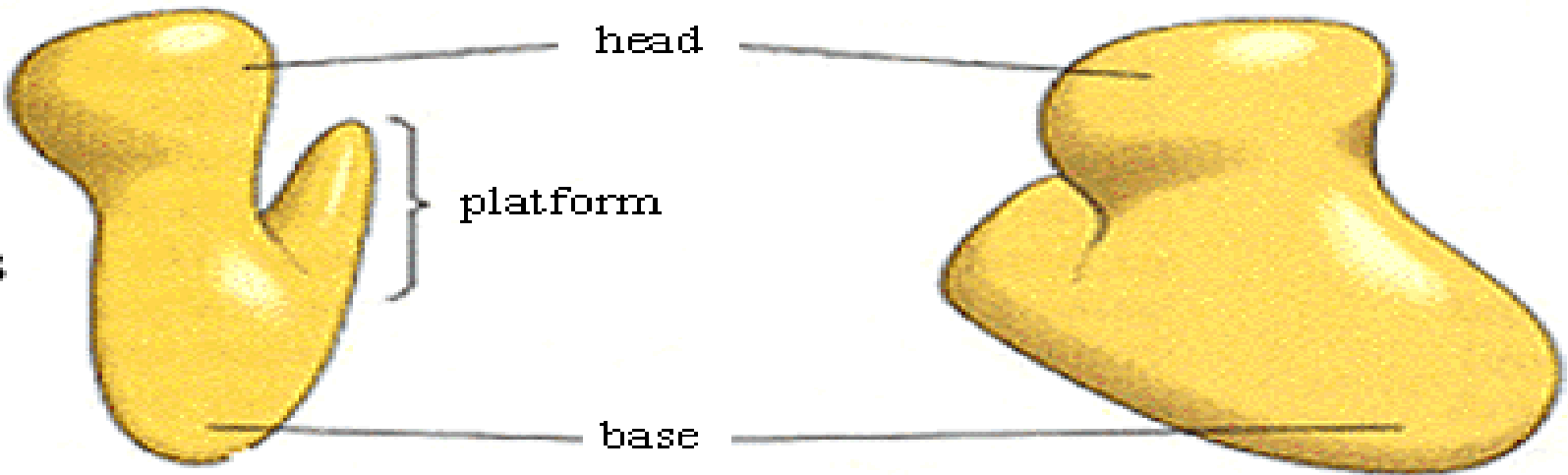
**30S**:Oval shaped, 90-110A in size.

**Formed of a platform, head & base or body.**

**Head & platform are separated by a cleft.**

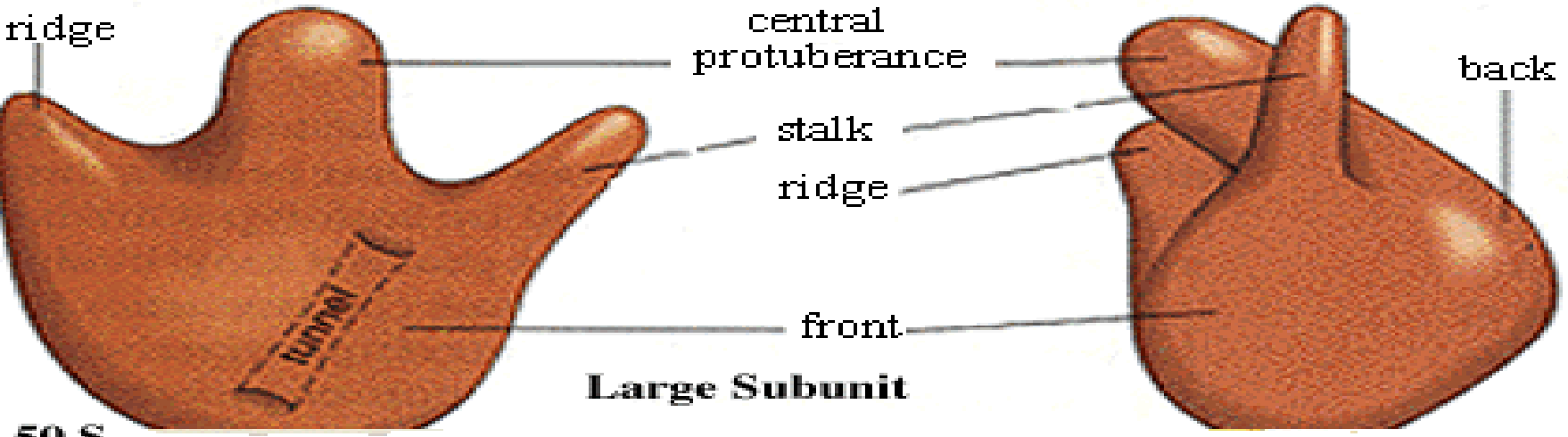
**Cleft is site of codon-anticodon interaction & a binding site for initiation factors.**

30 S



**Small Subunit**

ridge



50 S

**Large Subunit**

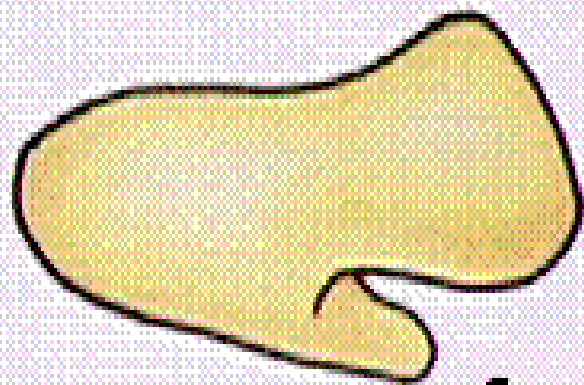
**Prokaryotic Ribosomes (70 S)**

# PROKARYOTIC RIBOSOME(70S)

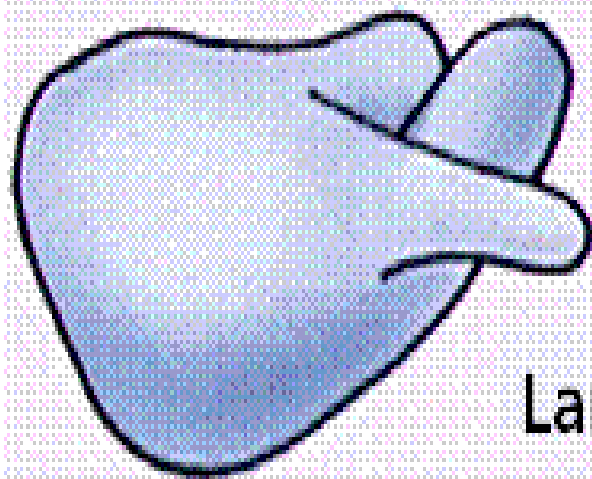
# 80S Ribosome:

- Larger 60S & smaller 40S subunits
- Two subunits are interconnected by strand of 30-60Å thickness.
- 60S subunit attached to ER.
- A channel is formed between two subunits.
- Channel is 140Å & is formed of 35-39 amino acids.
- It protects the polypeptide from action of enzymes.
- mRNA is threaded through this channel.
- During translation, mRNA is held by the smaller subunit,
- Charged t-RNAs are held by the larger subunit.

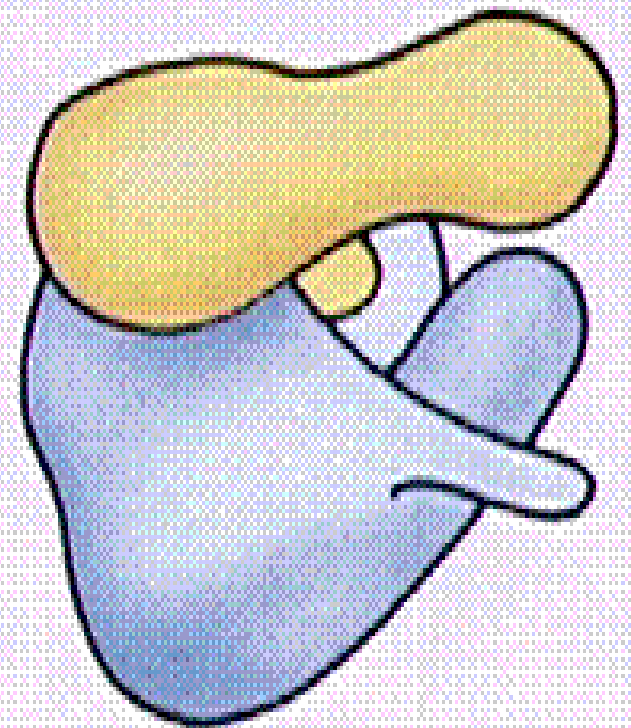
**Association & dissociation of ribosomal subunits depends upon Mg ion concentration.**



Small subunit



Large subunit



# **Chemical composition:**

**60-65% r-RNA**

**50S subunit :23S rRNA,5S rRNA**

**30S subunit:16S rRNA**

**60S subunit:28S rRNA,5SrRNA,5.8SrRNA**

**40S subunit:18SrRNA**

**In each ribosomal subunit rRNA is in the form of highly folded filament, different types of proteins are adhered to it.**

**60% rRNA is in double helix form.**

**Most abundant nitrogen bases are guanine & cytosine.**



# Ribosomal proteins:

70S ribosome:35-40%

80S ribosome:55%

70 different types of core( primary binding proteins) in eu karyotic ribosome.

55 types of proteins in prokaryotic ribosome.

**Ribosomal proteins act as enzymes to regulate translation.**

- Initiation factor F1 & F2:initiate the translation
- T-factor:catalyses the linking of charged tRNA at A site.
- Peptidyl transferase:regulates the formation of peptide bond between the amino acids at P-and A-site.
- G-factor(translocase):translocation of ribosome on mRNA
- Releasing factor:regulate termination of protein synthesis & release of polypeptide chain.

# Origin:

## In prokaryotes

**Completely cytoplasmic.**

**23S, 16S & 5S rRNA are transcribed by specific segments of nucleoid.**

**23S & 5S rRNA associates with cytoplasmic proteins to form 50S subunit.**

**16S rRNA along with their proteins form 30S subunit.**

# In eukaryotes:

**Partly nucleolar & partly cytoplasmic in origin.  
Nucleolar organising region transcribes 45S nucleolar RNA (precursor of 5.8, 28, 18S rRNAs).**

**5SrRNA is transcribed from the r-DNA lying adjacent to NOR.**

# **FUNCTIONS:**

**These are sites where specific no. & types of amino acids are linked in a specific sequence to form a polypeptide chain, so these are **protein factories** of the cell.**

**Free ribosomes are involved in synthesis of intracellular proteins.**

**ER-bound ribosomes synthesize proteins which act intercellularly.**