UARY

RIBOSOMES

DII Hons/Sub Zoology 12

Tuesday

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Ribosomes are cell organelle, which function as cell's protein factories they provide for the site of protein synthesis involving translation of the genetic information encoded in the messenger RNA (mRNA). When not engaged in protein synthesis, the ribosomes in a prokaryotic cell are always free, but in a eukaryotic cell, they may be found either free in the cytosol or attached on the ER (rough ER). In bacteria like E.coli, an individual ribosome sedimenting at 70S, ~2 MD (MD = megadalton) has an average diameter of 21-23 nm (1 nm = 10 A°), and consisting of two subunits, a smaller subunit (sedimenting at 30S) and a larger subunit (sedimenting at 50S). The ribosomes that are found in plastids and mitochondria largely resemble those in bacteria, although there are some variations. In eukaryotes, on the other hand the ribosome is slightly bigger in size (80S, ~4 MD), consisting of 40S smaller and 60S larger subunit. The association of the subunits into a complete ribosome is facilitated by Mg^{++} ion concentration, so that at a specific lower Mg^{++} ion concentration the subunits fall apart and at sufficiently higher Mg^{++} ion concentration, the ribosomes may trimdimer. When engaged in engaged in protein synthesis, ribosomes can be found in cluster,

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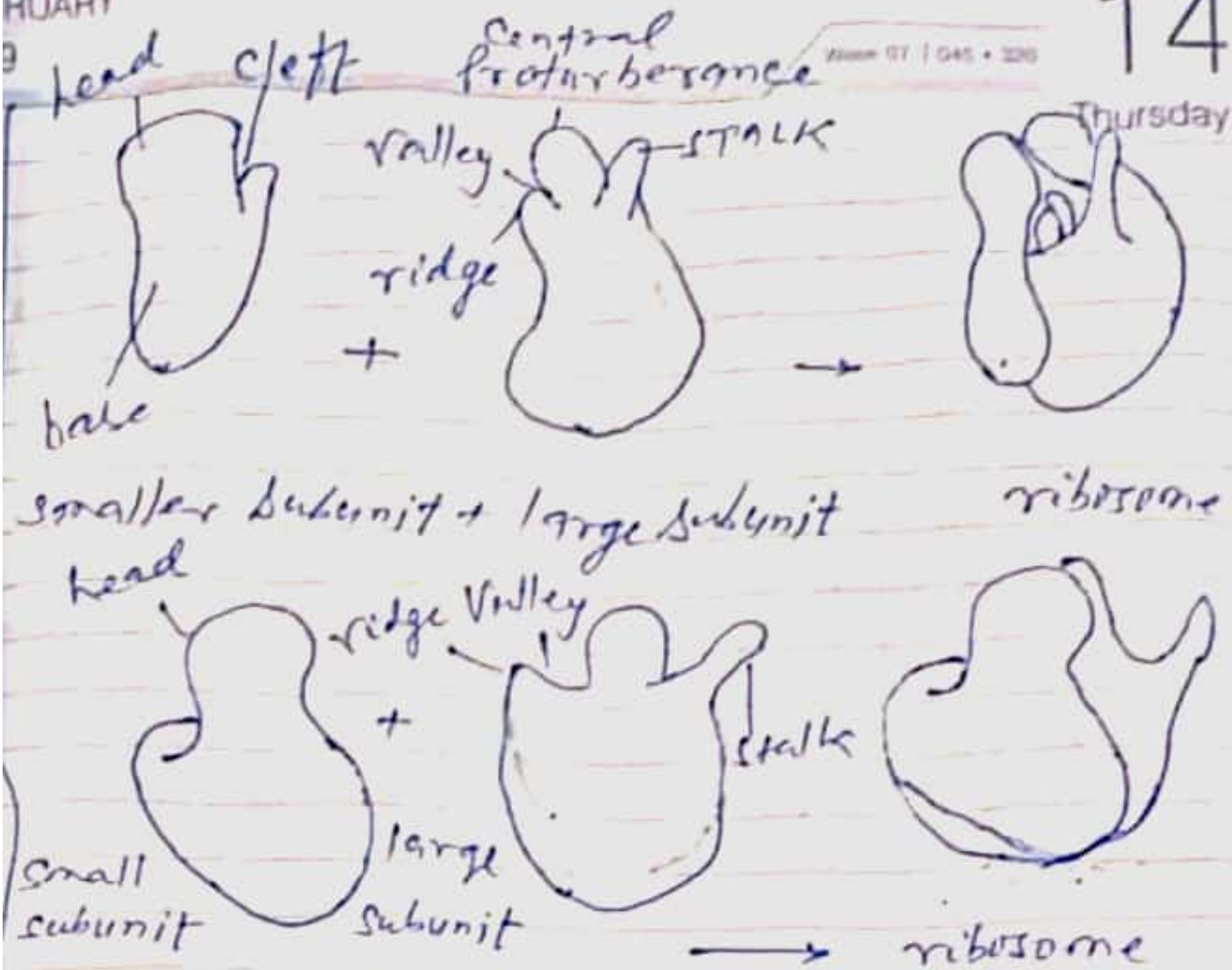
as polyribosomes, held together with the help of mRNA.

ULTRASTRUCTURE

The structure of the two subunits and that of the complete bacterial ribosome as viewed under the electron microscope is shown. It can be seen that the smaller subunit consist of a head, base and a platform, the platform separating the head from the base with the help of a cleft (also called shoulder). The larger subunit seems to be a solid monolithic structure having a ridge a central protuberance (CP) and a stalk. The ridge and CP separated by a valley.

Source of Ribosomes	Sedimentation Coefficient	ribosomal RNA (rRNA)
Liver, yeast, Bean, Neurospora	80S (60S, 40S)	28S, 18S
E. coli	70S	23S, 16S
chloroplast	50S + 30S	
Mitochondria	60S + 78S	



CHEMICAL COMPOSITION AND ORGANIZATION

Each bacterial ribosome contains three species of ribosomal RNA (rRNA) and more than 50 different ribosomal proteins (r-proteins). The rRNA makes as much as 60-70% of the ribosome. The 30S subunit is composed of 16S rRNA and 21 different proteins (S1 to S21), whereas the 50S subunit contains 23S r-RNA), 5S rRNA and more than 30 different r-proteins (L1 to L34). A similar organization as also found in a eukaryotic ribosome, although in addition to the above, a 5.8S rRNA

species is also found in eukaryotes (28S rRNA = ~5000 nt, 18S rRNA = ~2000 nt, 5.8S rRNA = 160 nt, 5S rRNA = 120 nt), it has been possible to dissociate rRNA and r-proteins from ribosomal subunits, and reconstitute the subunits from its components, so that if the reconstitution of ribosomes was allowed in the absence of a specific r-protein, the function of this protein could be studied. The location of this protein could be studied. The location of some important proteins and sites for specific function.