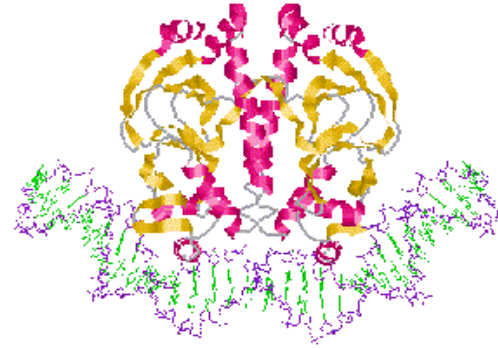


# Translation and proteins

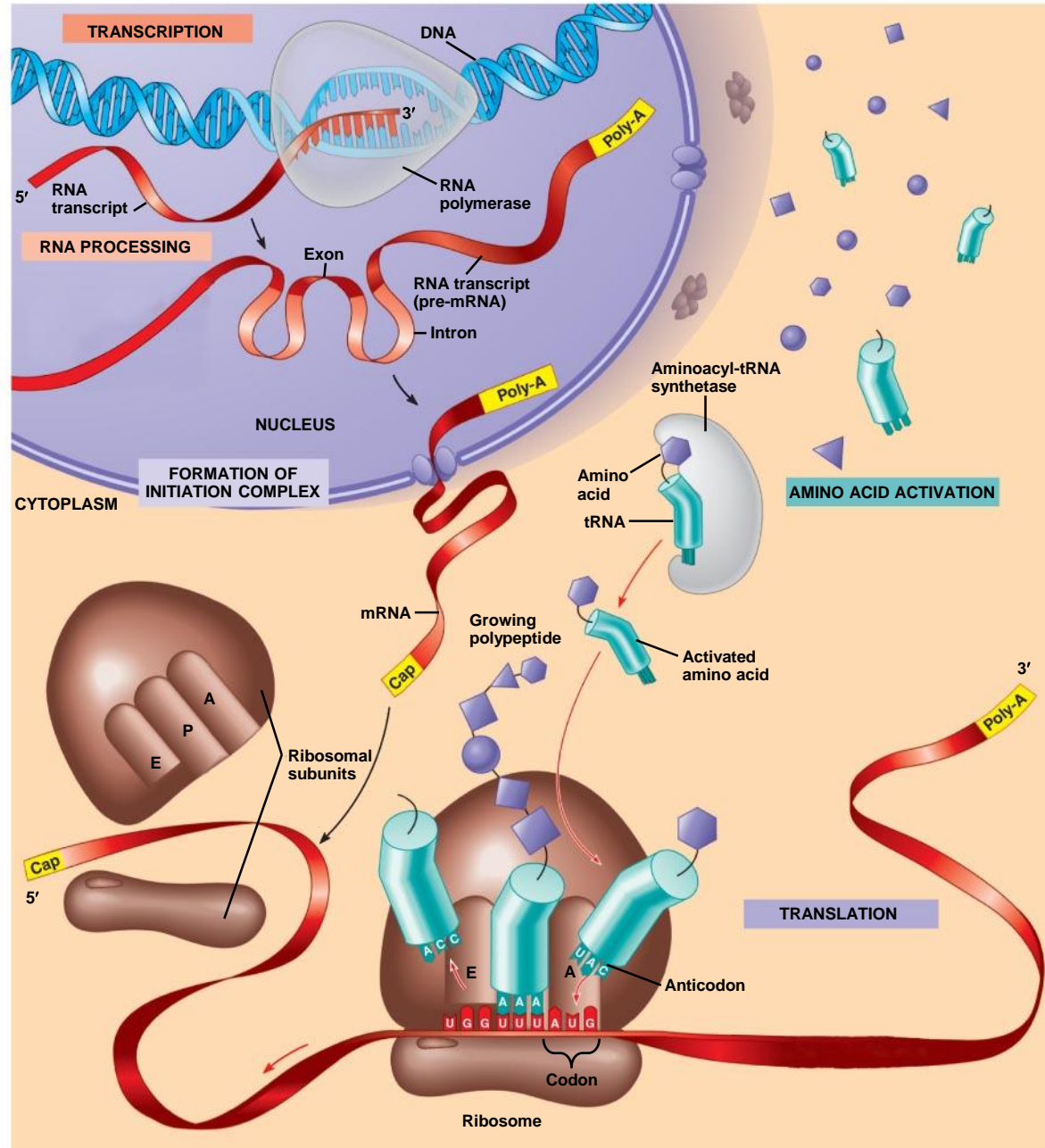


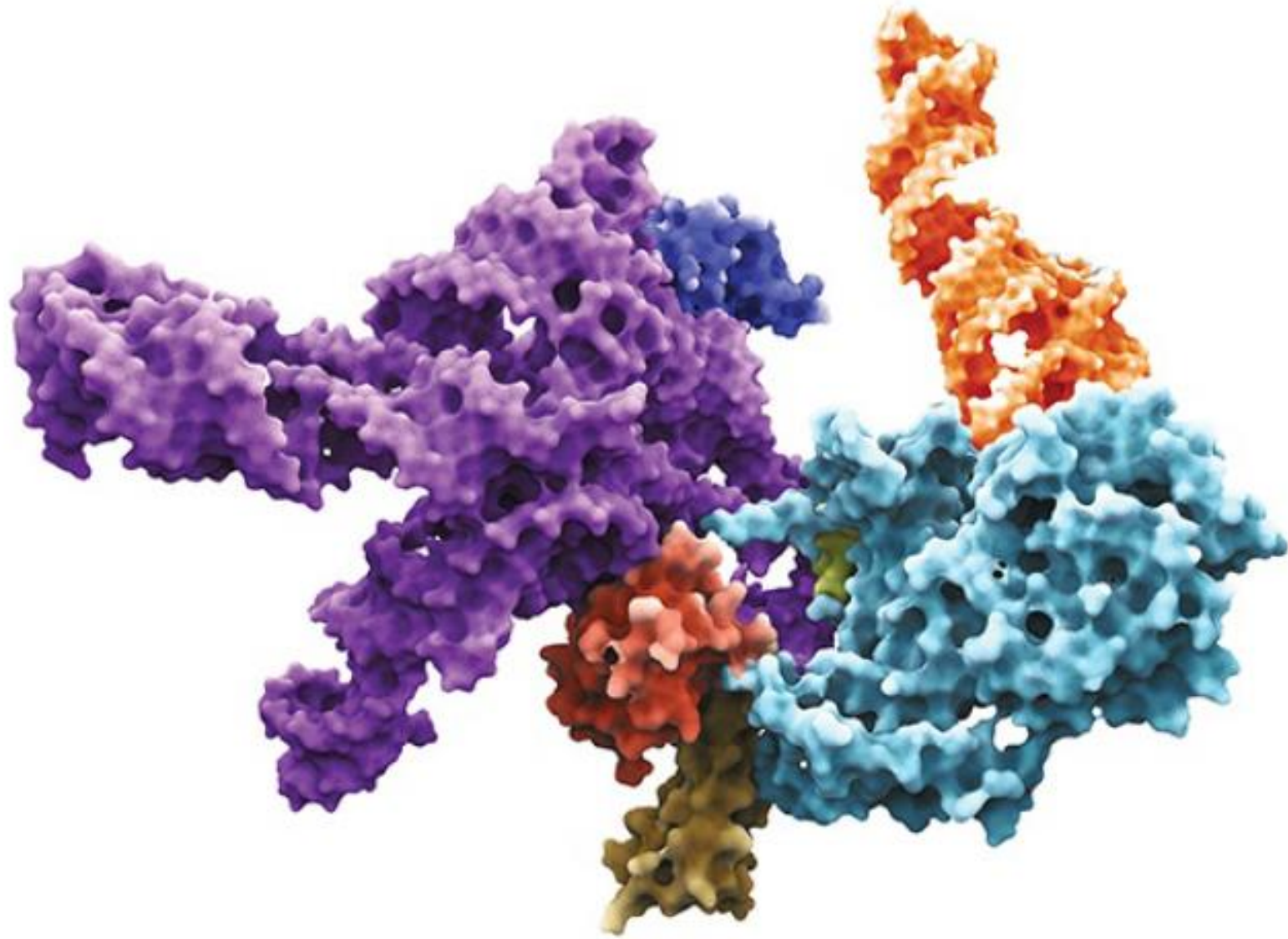
Prof. Dr. İsmail AKYOL  
Prof. Dr. M. Ali YILDIZ  
Prof. Dr. M. Muhip ÖZKAN  
Ankara Üniversitesi



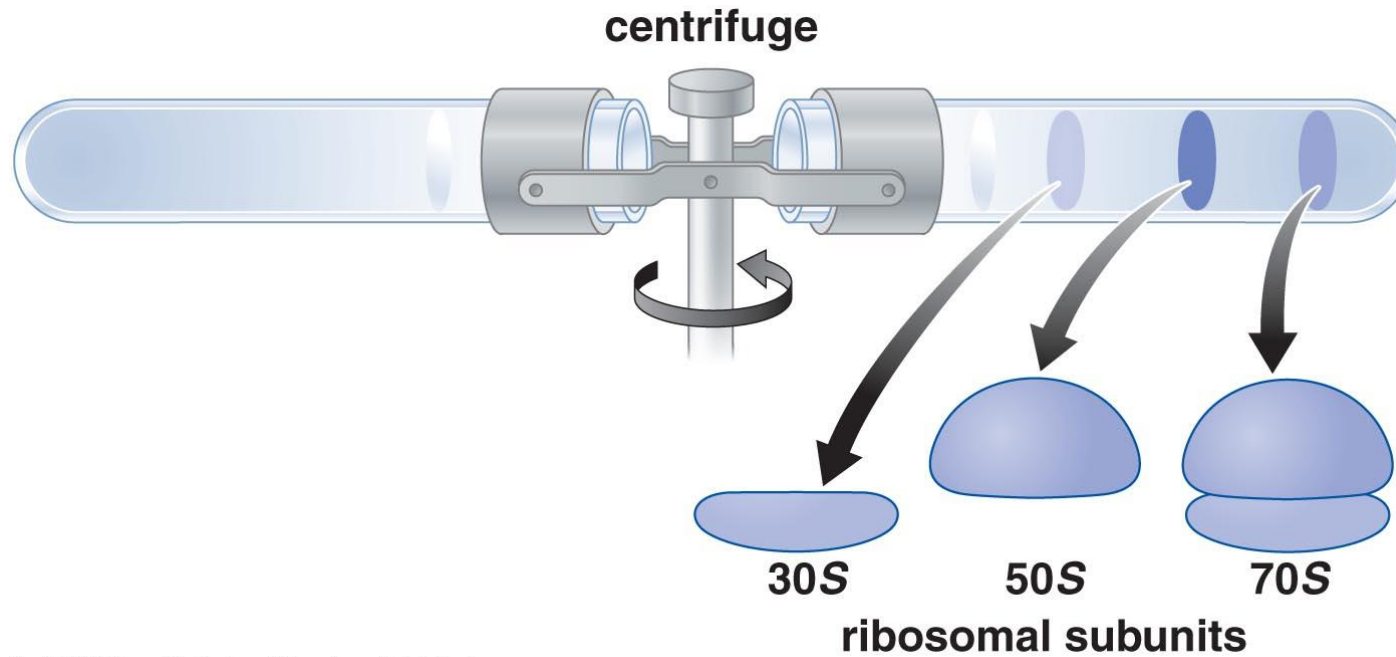
## Outline of course

- The ribonucleotide sequence of messenger RNA (mRNA) reflects genetic information stored in the DNA of genes and corresponds to the amino acid sequences in proteins encoded by those genes.
- The process of translation decodes the information in mRNA, leading to the synthesis of polypeptide chains.
- Translation involves the interactions of mRNA, tRNA, ribosomes, and a variety of translation factors essential to the initiation, elongation, and termination of the polypeptide chain.
- Proteins achieve a three-dimensional conformation that arises from the primary amino acid sequences of the polypeptide chains making up each protein.
- The function of any protein is closely tied to its threedimensional structure, which can be disrupted by mutation.

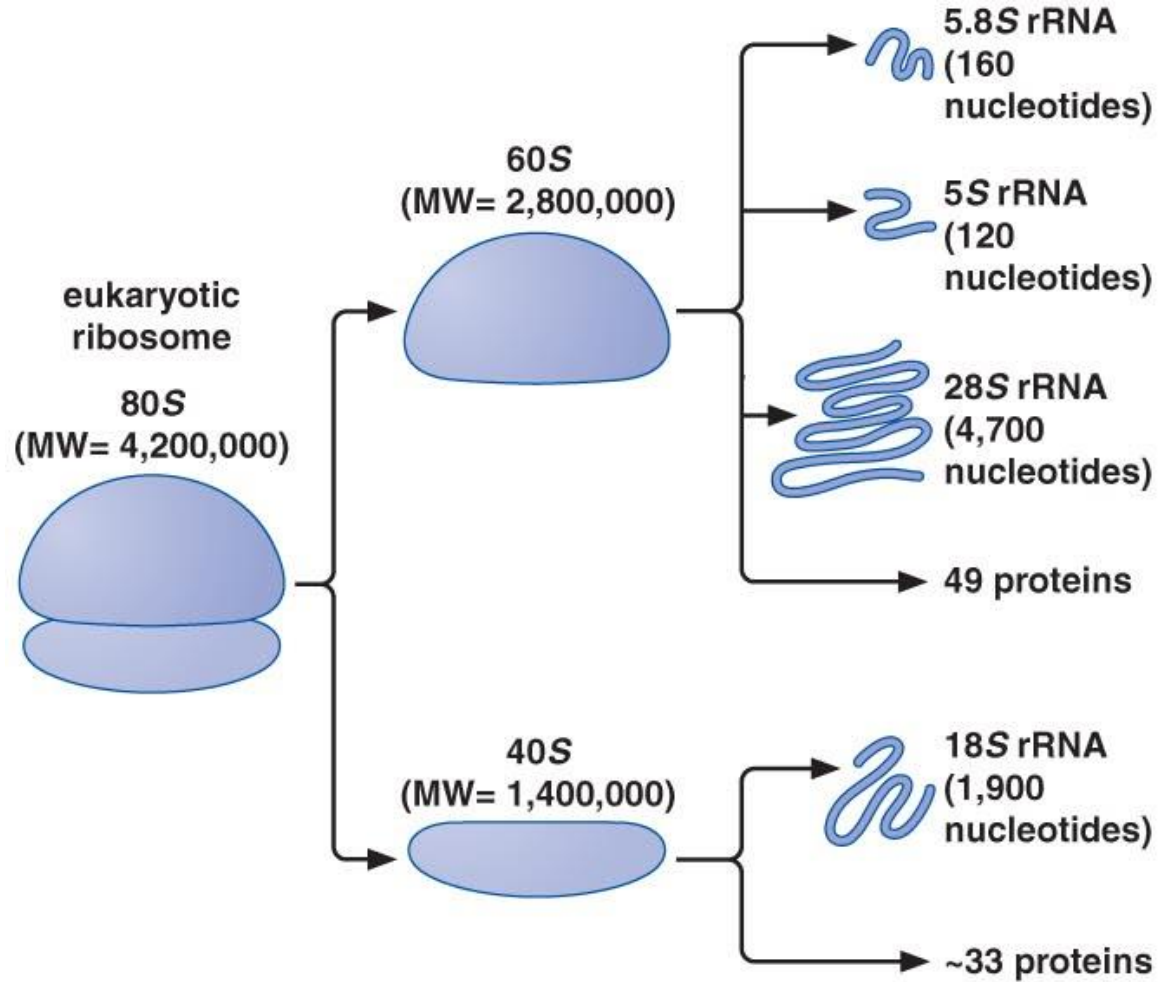




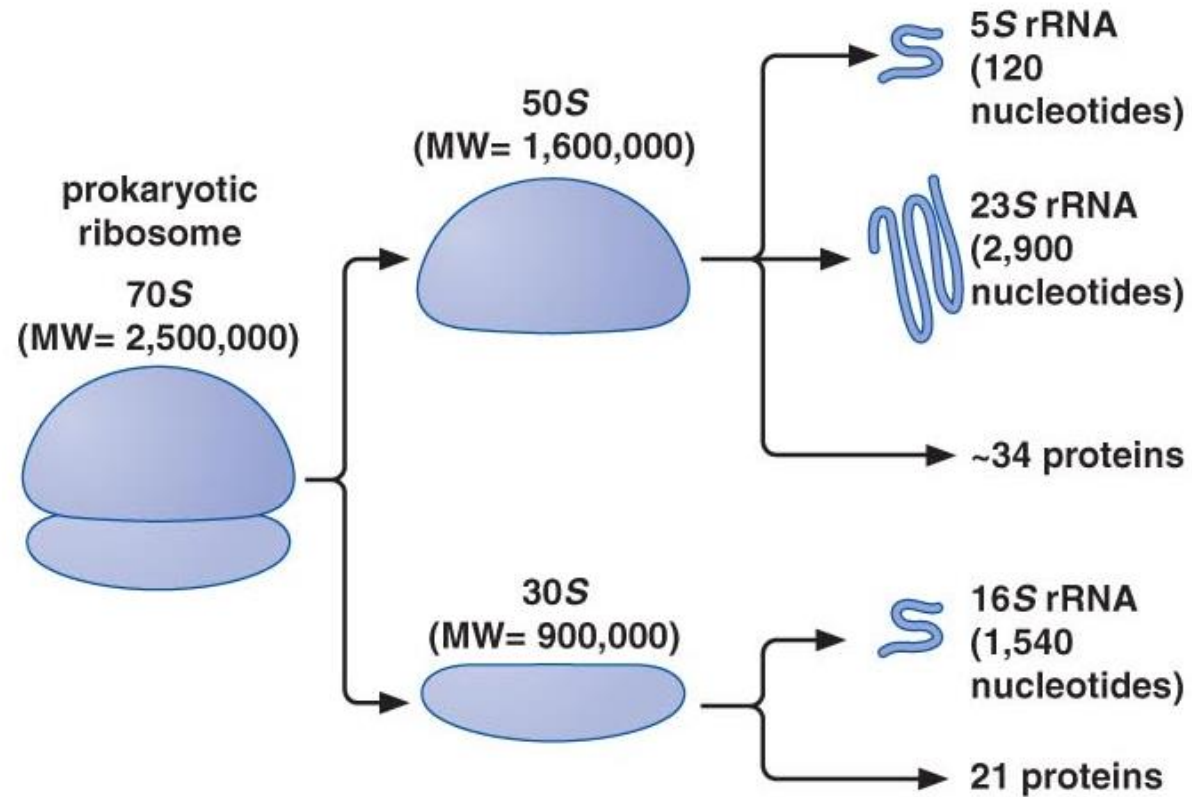
# Ribosome Structure



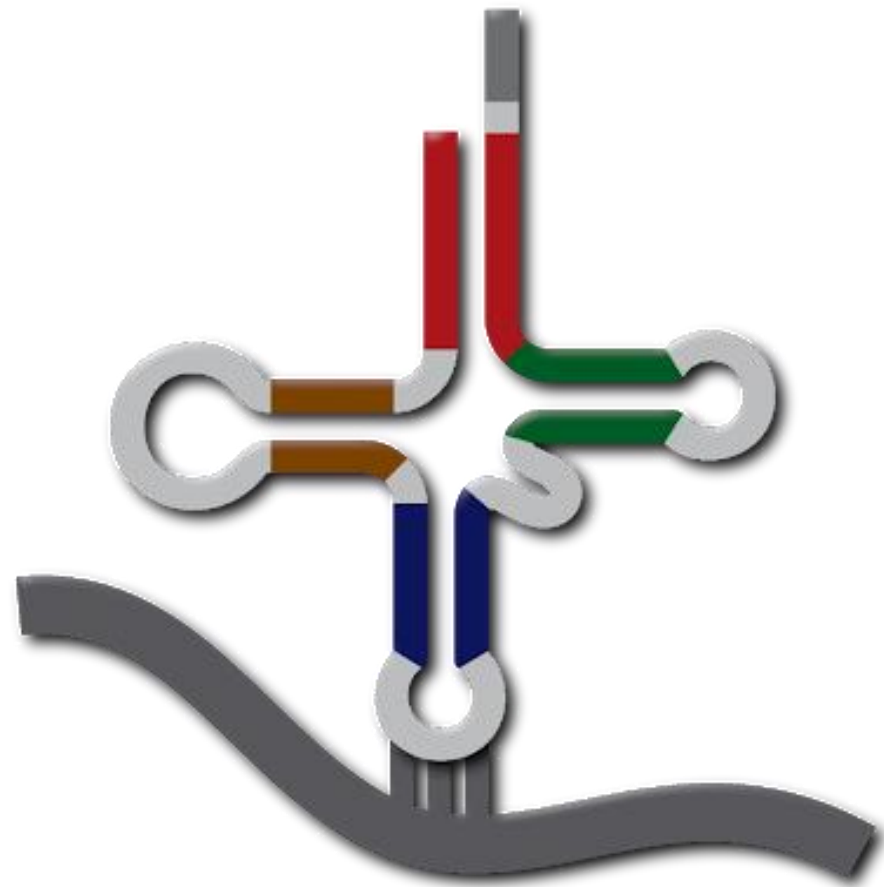
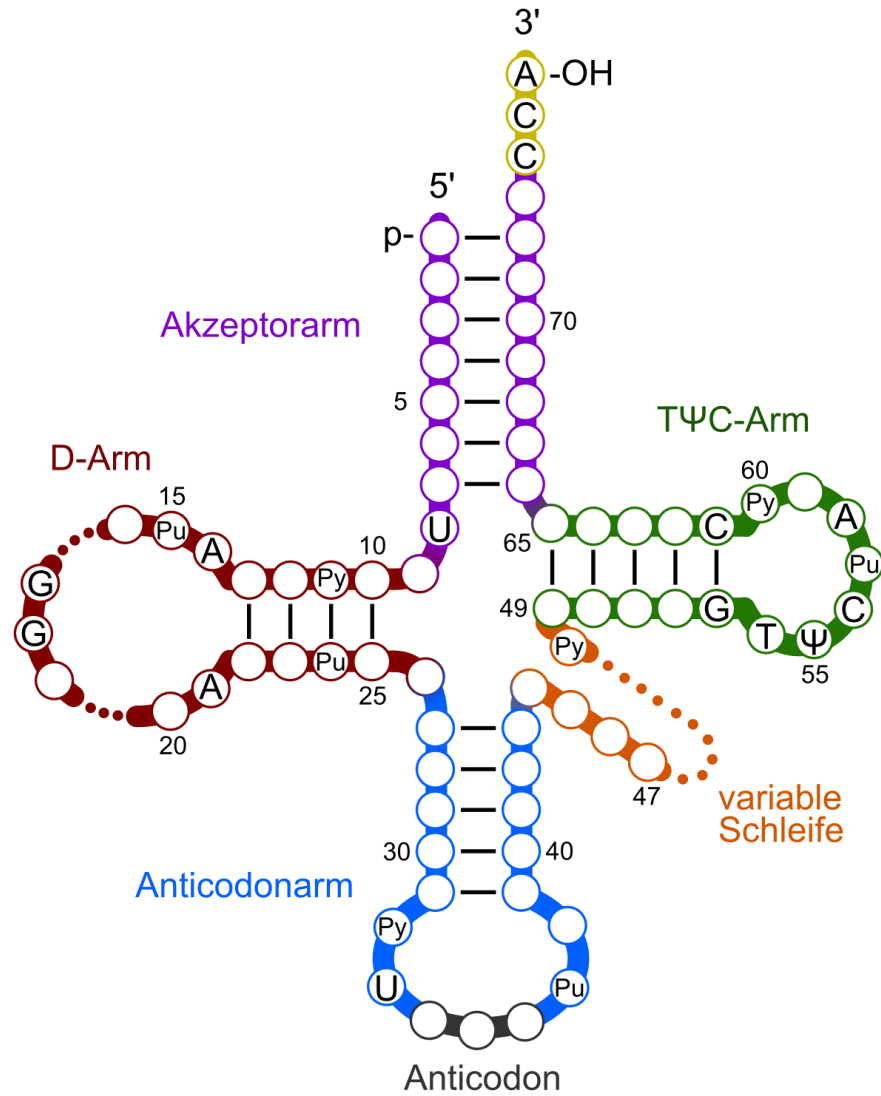
# Eukaryotic Ribosome



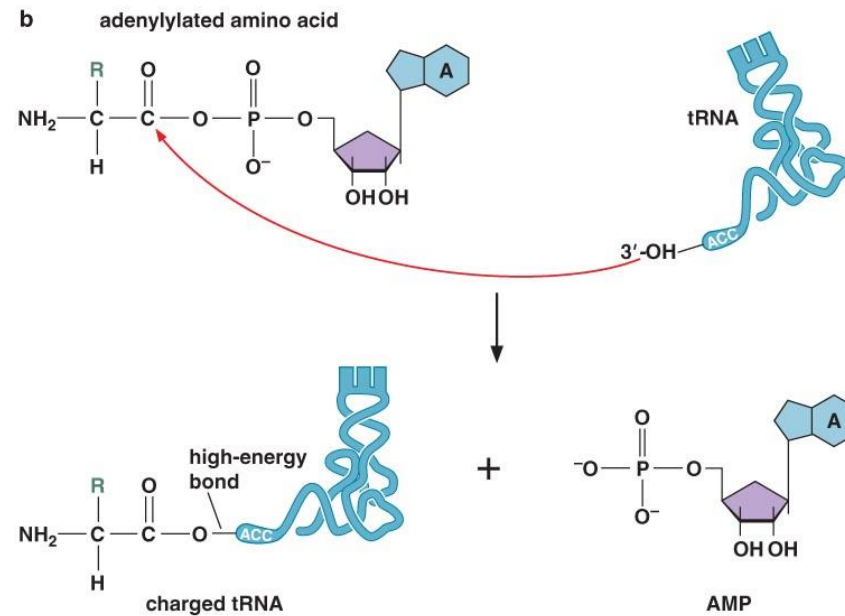
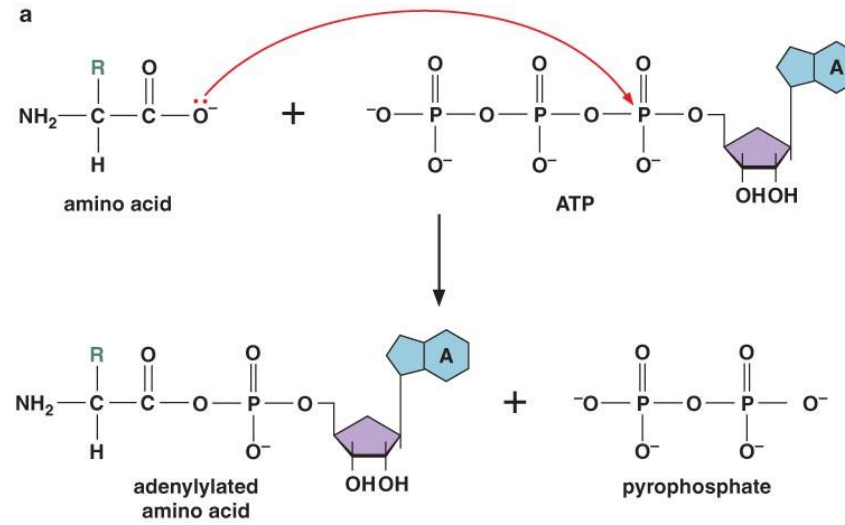
# Prokaryotic Ribosome



# tRNA Structure









# Genetics Code

5' AUGAAAGCAAUUUUCGUACUGAAAGGUUGGUGGCACUUCU 3'  
UGA

M K A I F V L K G W W R T S stop

5' AUGAAGCAAUUUUCGUACUGAAAGGUUGGUGGCACUUCUGA 3'

stop K Q F S Y stop K V G G A L P

5' AUGAAGCAAUUUUCGUACUGAAAGGUUGGUGGCACUUCUGA 3'

E S N F R T E R L V A H F L



# Genetics Code

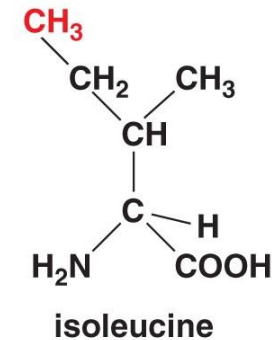
	U	C	A	G	
U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G
C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U C A G
A	AUU } AUC } Ile AUA } AUG Met	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



# Amino Acids

## Amino Acids

1- Alanine	Ala	A
2- Arginine	Arg	R
3- Asparagine	Asn	N
4- Aspartate	Asp	D
5- Cysteine	Cys	C
6- Glutamate	Glu	E
7- Glutamine	Gln	Q
8- Glycine	Gly	G
9- Histidine	His	H
10- Isoleucine	Ile	I
11- Leucine	Leu	L



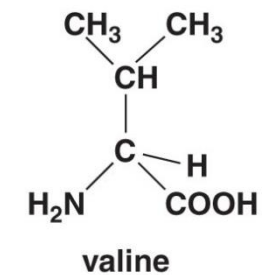
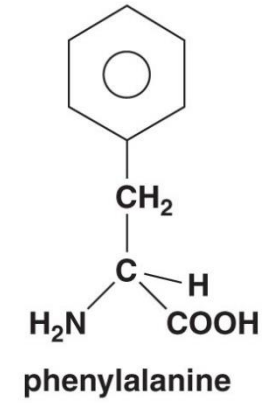
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## Amino Acids

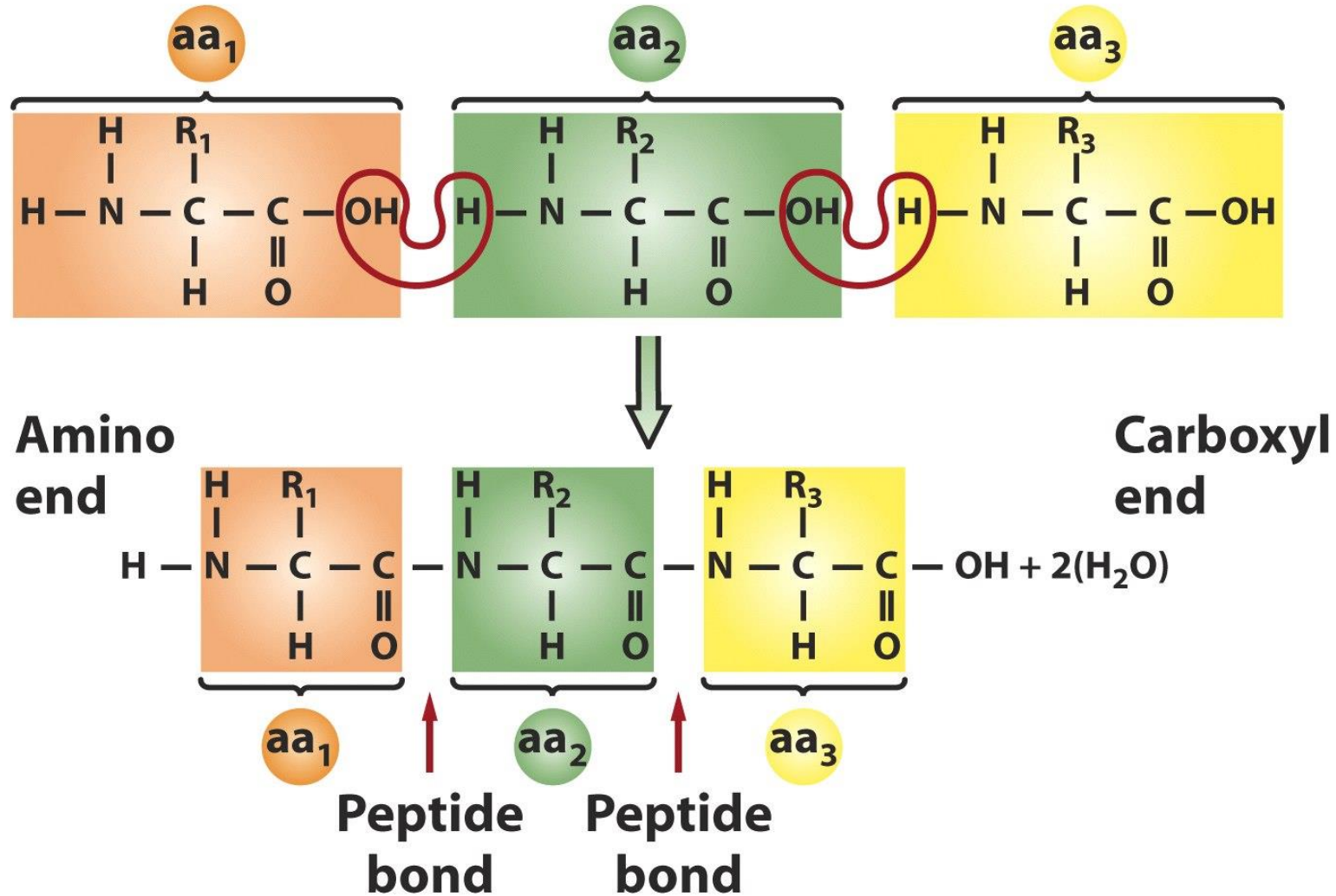
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12- Lysine	Lys	K
13- Methionine	Met	M
14- Phenylalanine	Phe	F
15- Proline	Pro	P
16- Serine	Ser	S
17- Threonine	Thr	T
18- Tryptophan	Trp	W
19- Tyrosine	Tyr	Y
20- Valine	Val	V

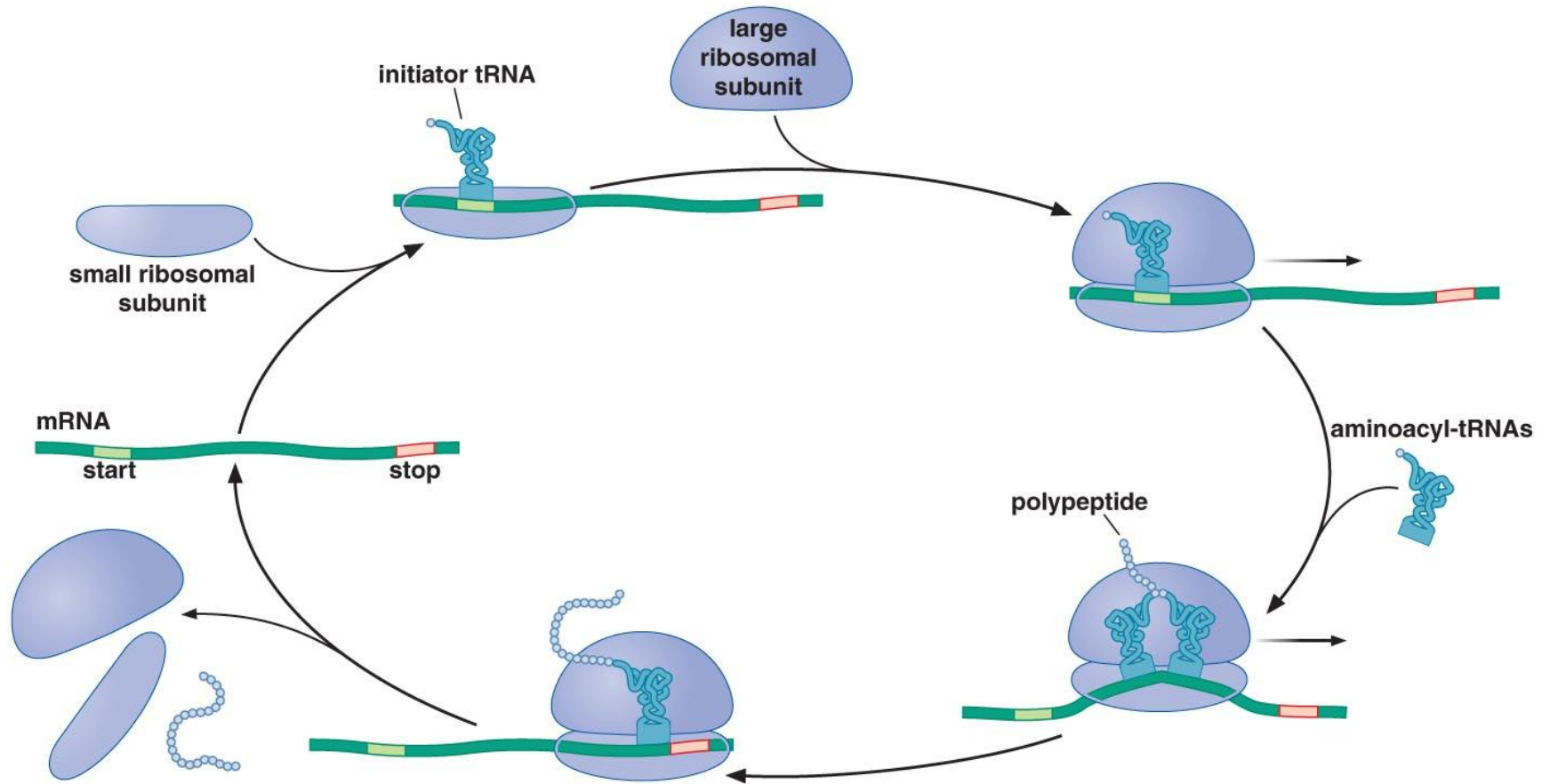
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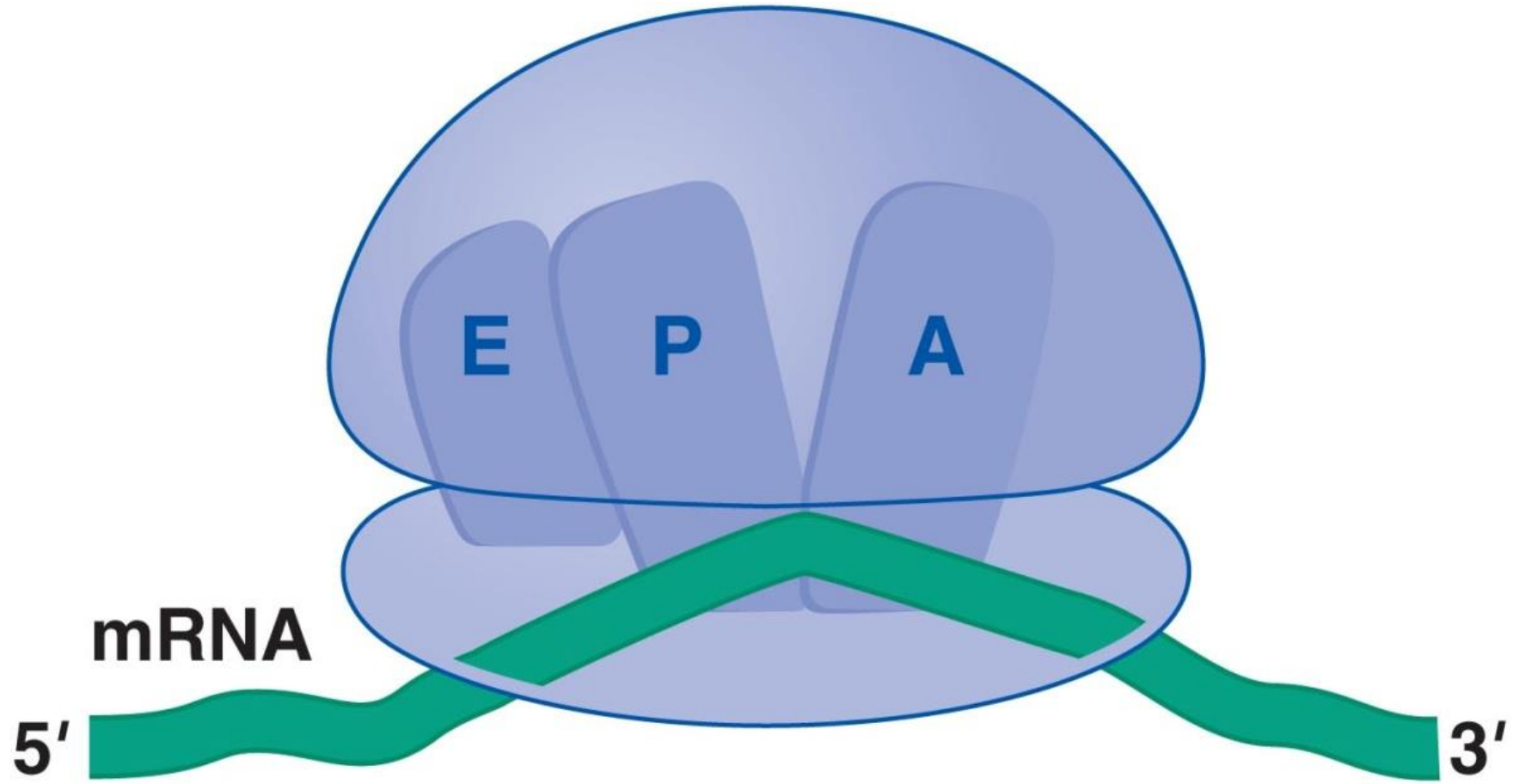


# Peptide bond

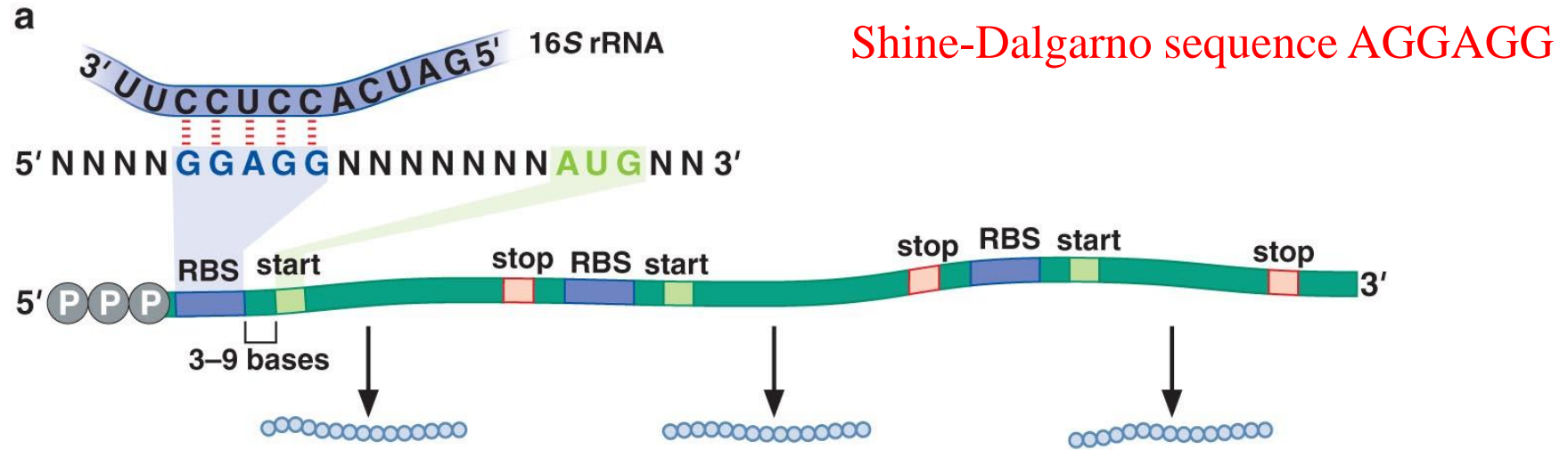


# Translation

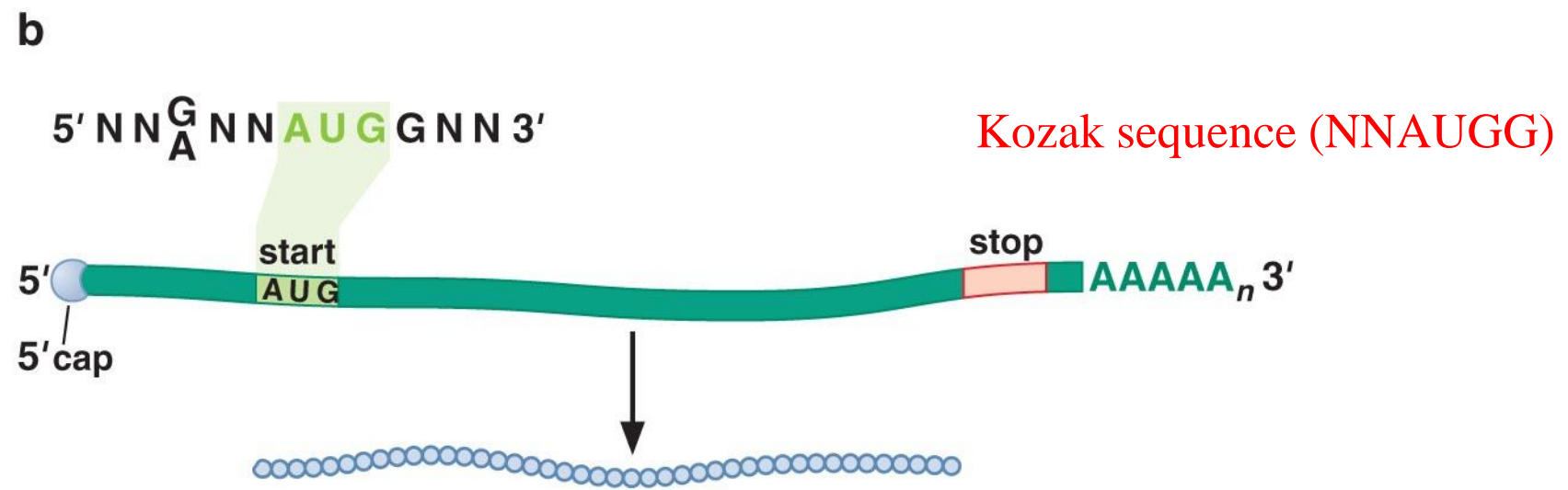




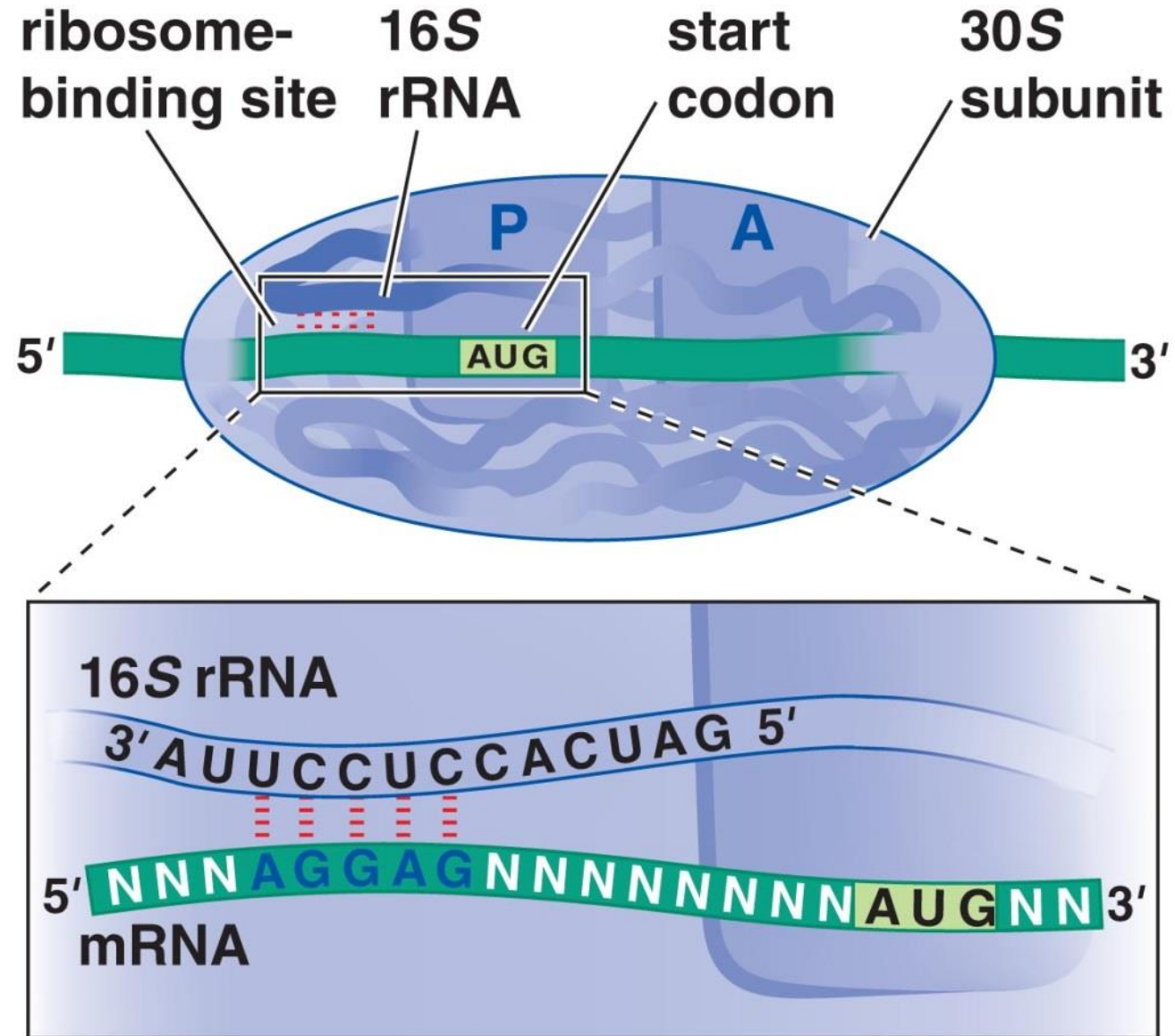


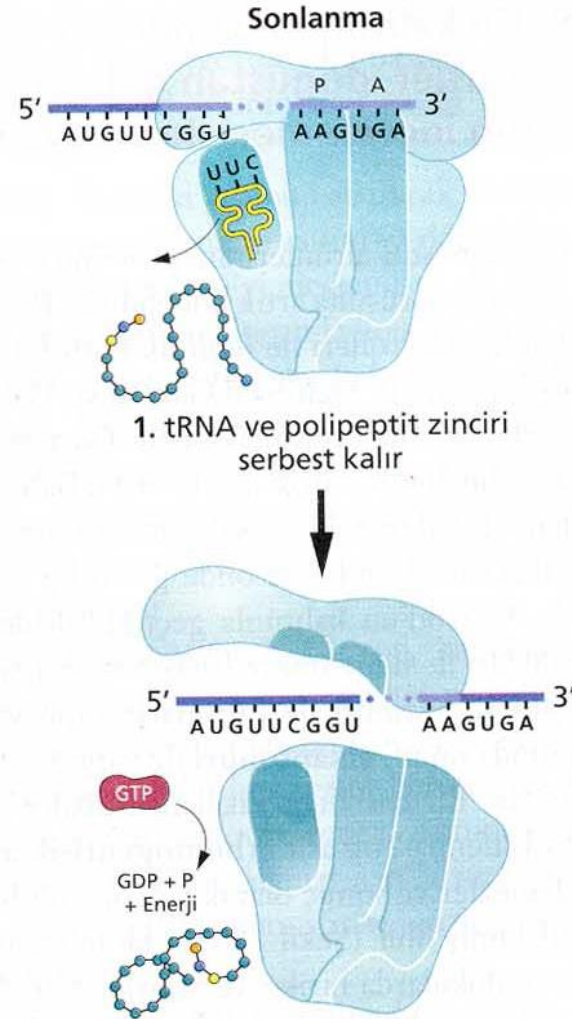


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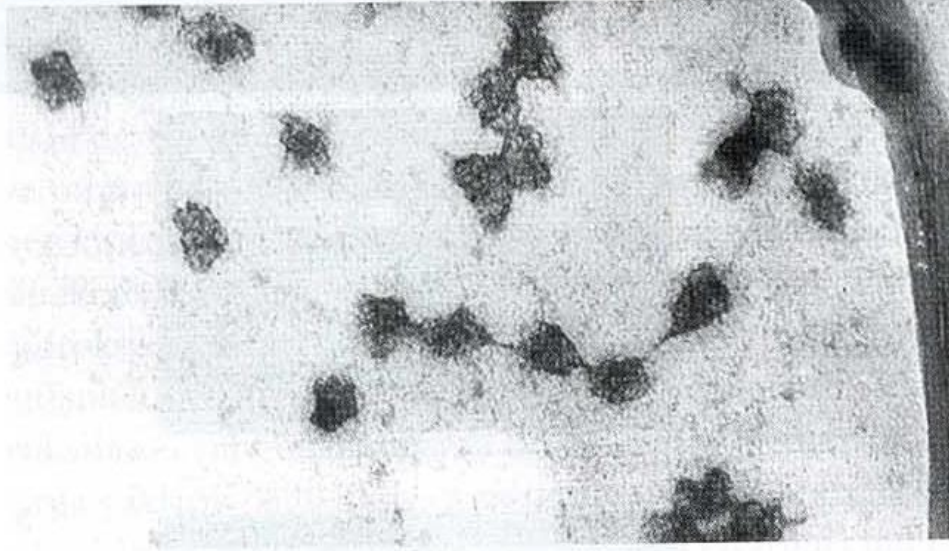




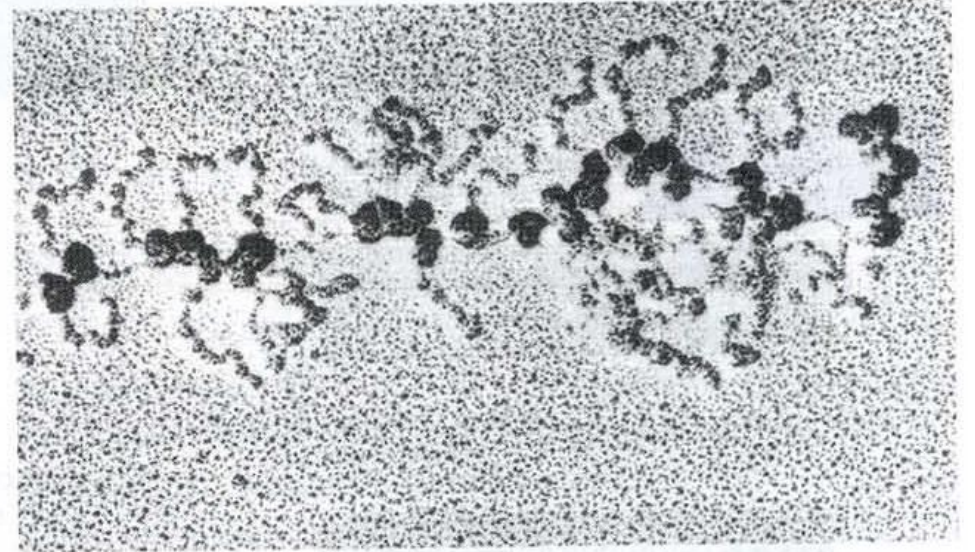
2. GTP-bağımlı sonlanma faktörleri aktif duruma geçer; bileşenler ayrılır; polipeptit zinciri katlanarak proteini oluşturur

**ŞEKİL 14.8** Translasyon işleminin sonlanmasının şematik gösterimi.

# Polyribosome

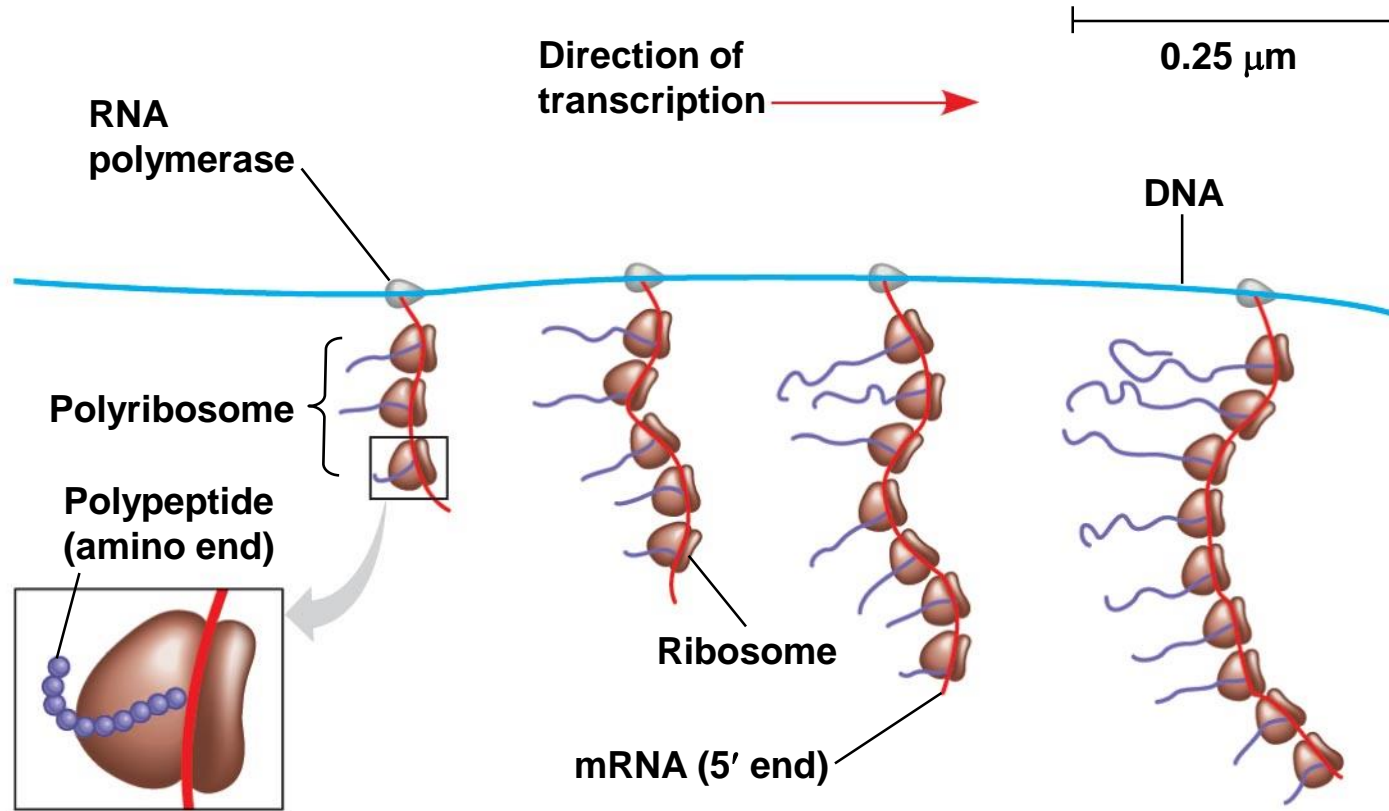
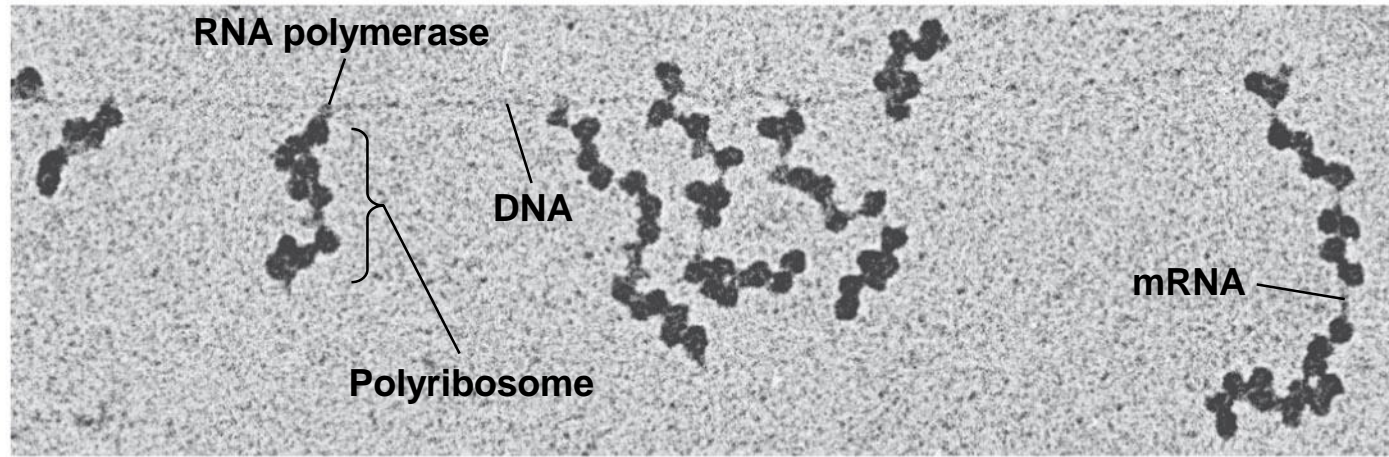


(a)



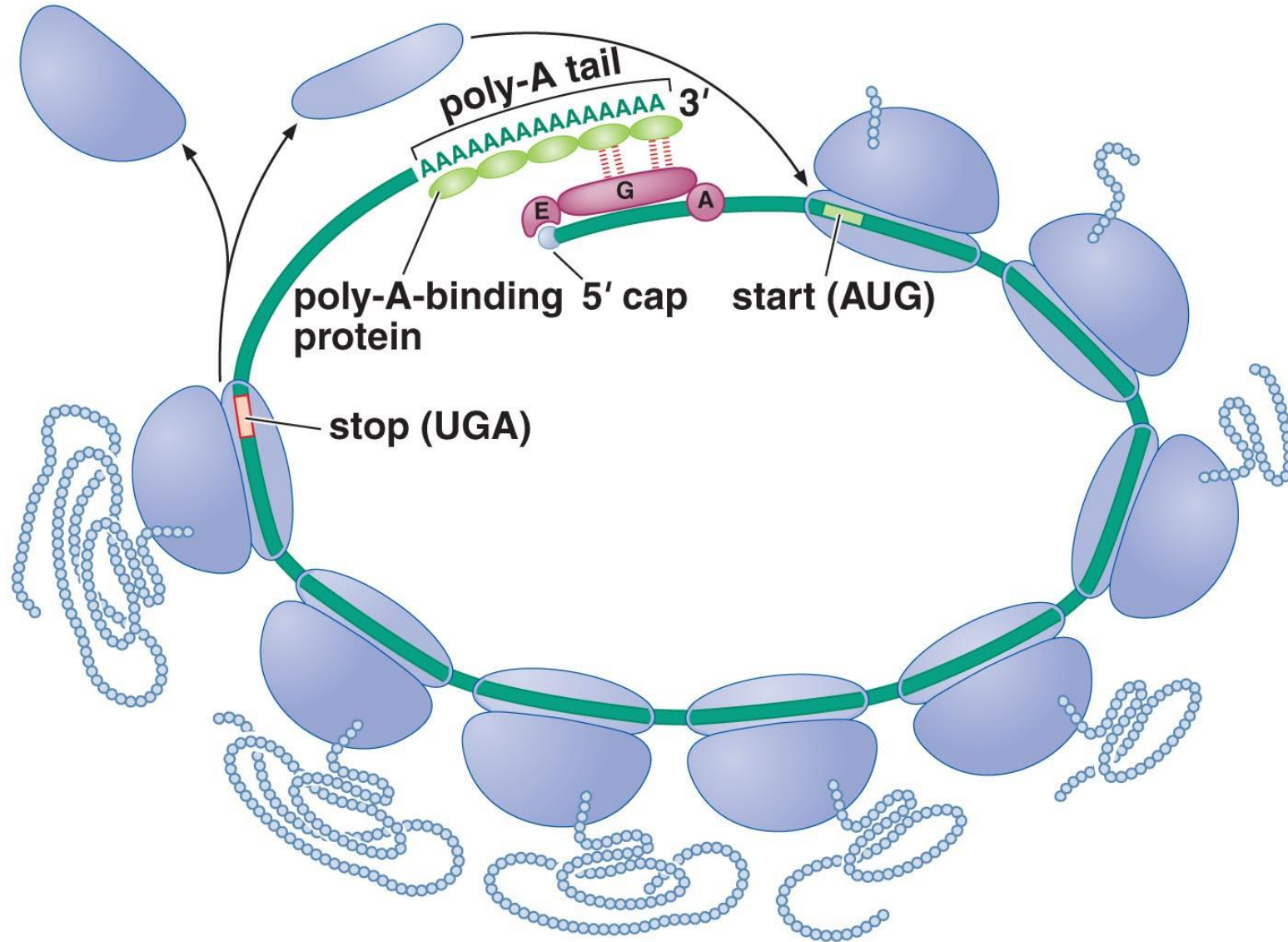
(b)

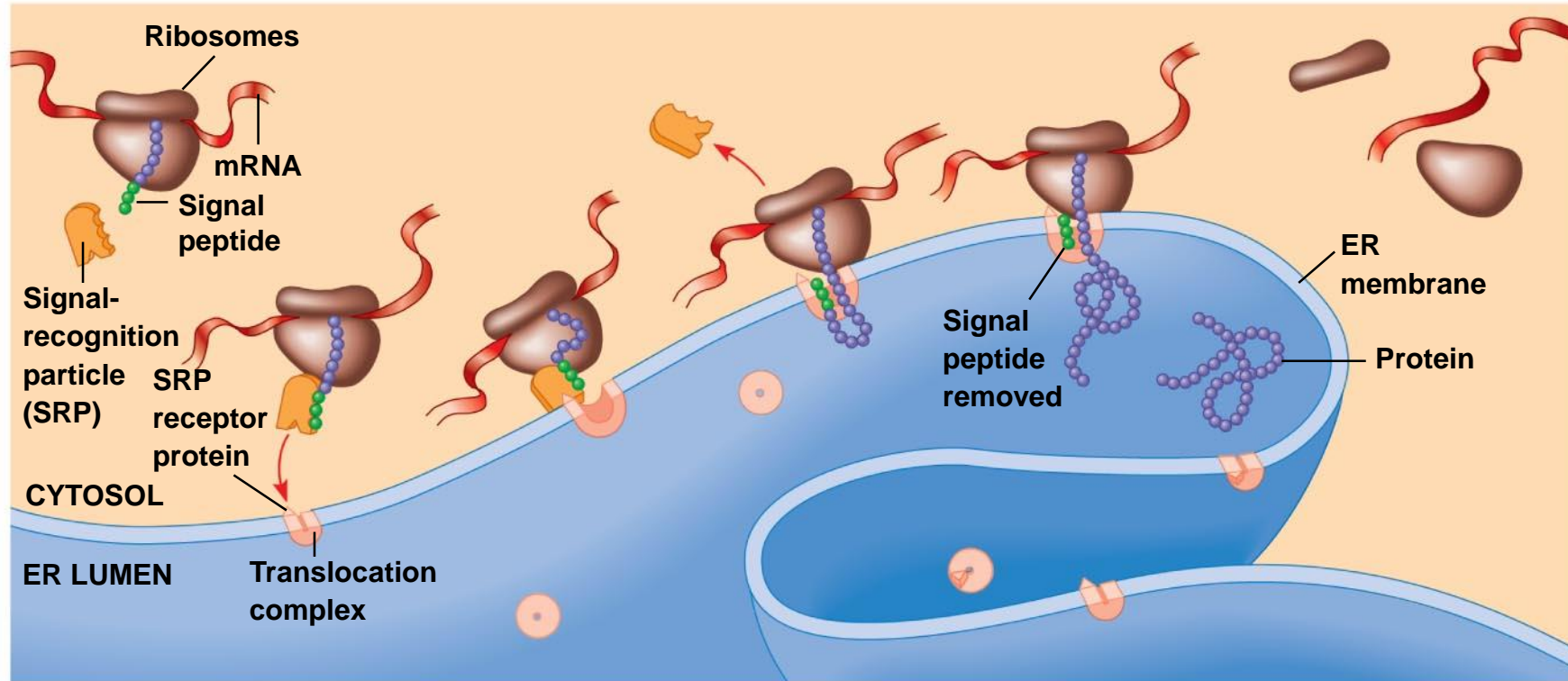
**ŞEKİL 14.9** Poliribozomların elektron mikroskop görüntüsü (a) tavşan retikülositlerinde hemoglobin mRNA'sının translasyona katılan kısmı (b) *Chironomus thummi*'nin dev tükürük bezi hücrelerindeki poliribozomlar. Yeni sentezlenen polipeptit zincirinin ribozomlardan çıkışı (b)'de açıkça görülmektedir. mRNA üzerinde translasyon soldan (5') sağa doğru (3') ilerledikçe zincirin boyu uzamaktadır.



**BOX 14-5 TABLE 1** Antibiotics: Targets and Consequences

Antibiotic/Toxin	Target Cells	Molecular Target	Consequence
Tetracycline	Prokaryotic cells	A site of 30S subunit	Inhibits aminoacyl-tRNA binding to A site
Hygromycin B	Prokaryotic and eukaryotic cells	Near A site of 30S subunit	Prevents translocation of A-site tRNA to P site
Paromycin	Prokaryotic cells	Adjacent to A-site codon–anticodon interaction site in 30S subunit	Increases error rate during translation by decreasing selectivity of codon–anticodon pairing
Chloramphenicol	Prokaryotic cells	Peptidyl transferase center of 50S subunit	Blocks correct positioning of A site aminoacyl-tRNA for peptidyl transfer reaction
Puromycin	Prokaryotic and eukaryotic cells	Peptidyl transferase center of large ribosomal subunit	Chain terminator; mimics 3' end of aminoacyl-tRNA in A site and acts as acceptor for nascent polypeptide chain
Erythromycin	Prokaryotic cells	Peptide exit tunnel of 50S subunit	Blocks exit of growing polypeptide chain from the ribosome; arrests translation
Fusidic acid	Prokaryotic cells	EF-G	Prevents release of EF-G–GDP from the ribosome
Thiostrepton	Prokaryotic cells	Factor-binding center of 50S subunit	Interferes with the association of IF2 and EF-G with factor-binding center
Kirromycin		EF-Tu	Prevents conformational changes associated with GTP hydrolysis and therefore EF-Tu release
Ricin and $\alpha$ -Sarcin (protein toxins)	Prokaryotic and eukaryotic the cells	Chemically modifies RNA in factor-binding center of large ribosomal subunit	Prevents activation of translation factor GTPases
Diphtheria toxin	Eukaryotic cells	Chemically modifies EF-Tu	Inhibits EF-Tu function
Cycloheximide	Eukaryotic cells	Peptidyl transferase center of 60S subunit	Inhibits peptidyl transferase activity





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