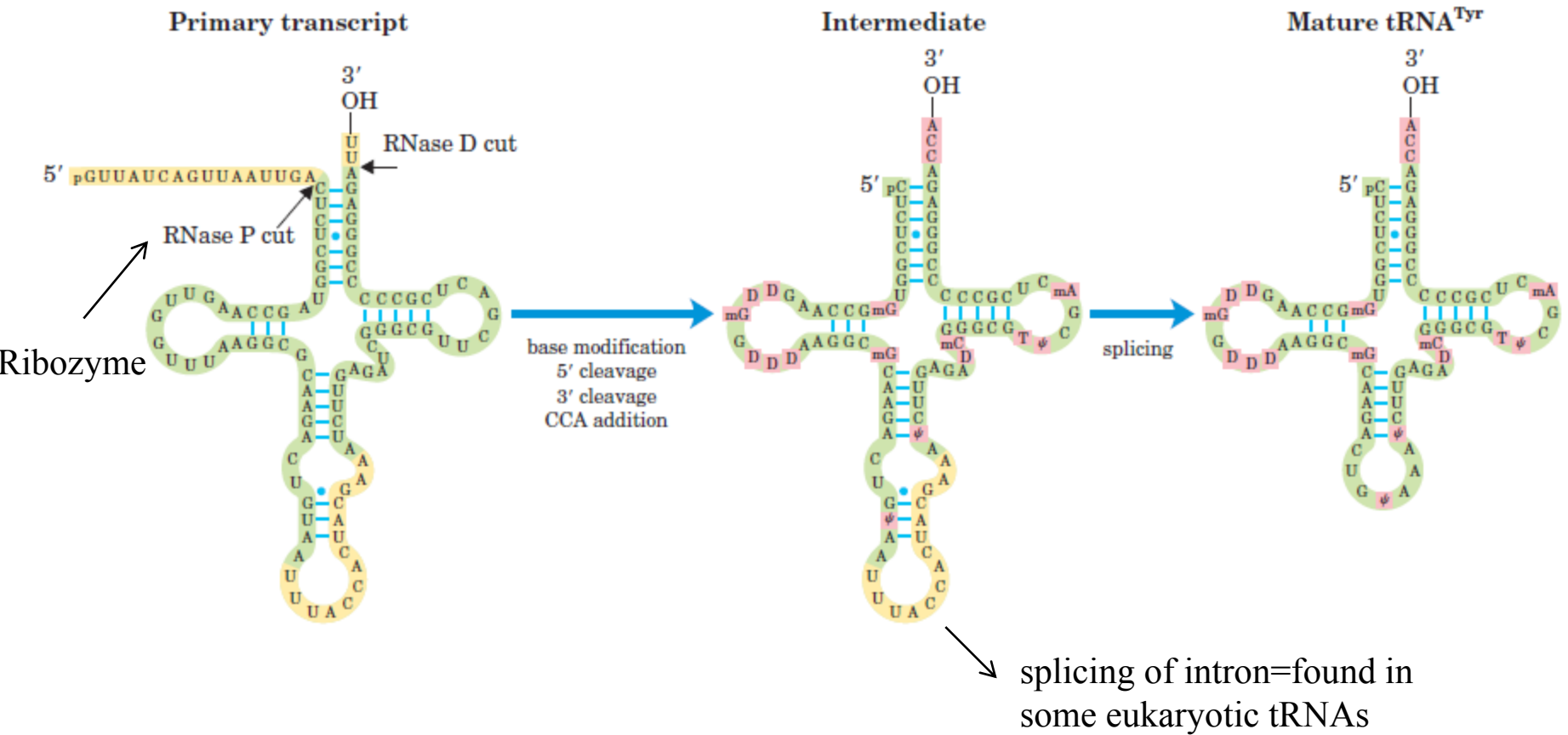
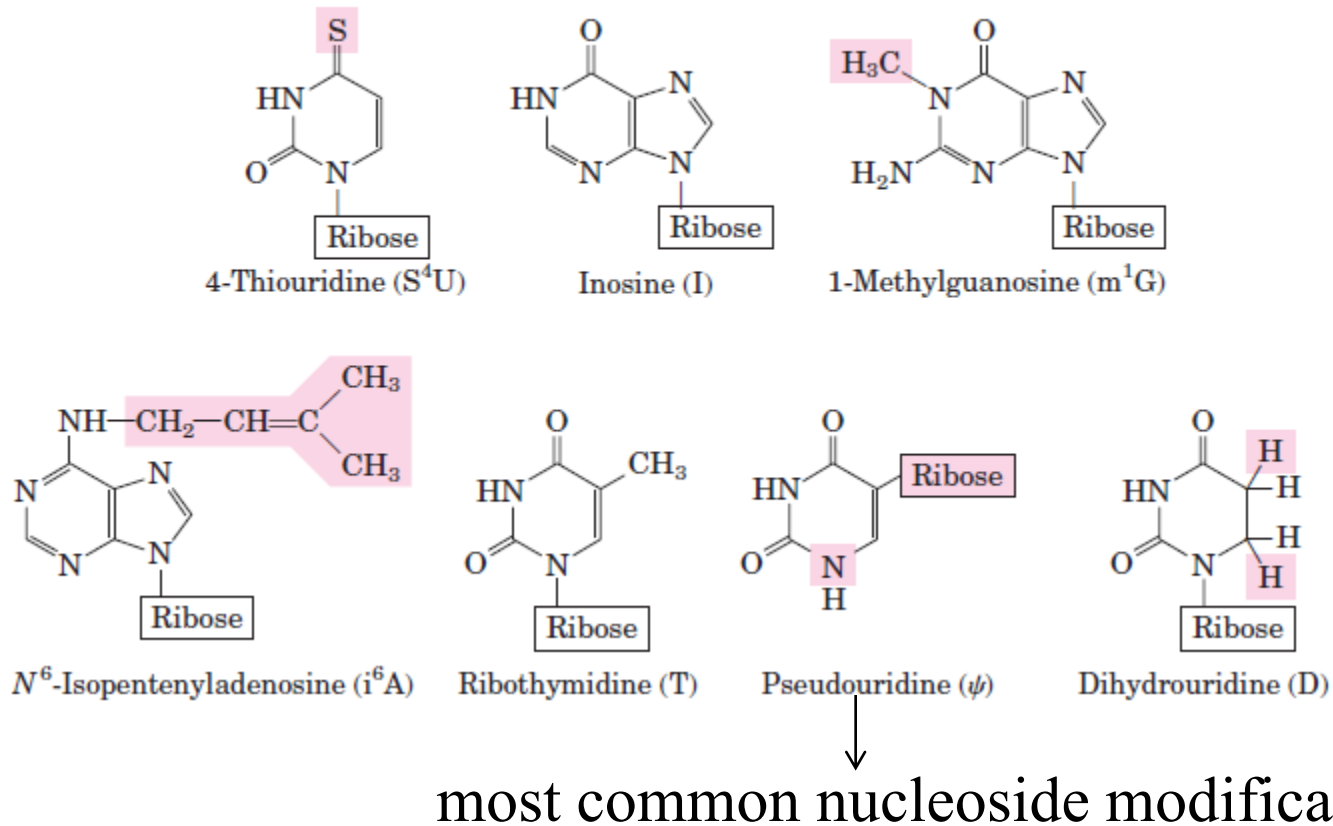


Ribosomal RNAs and tRNAs Also Undergo Processing

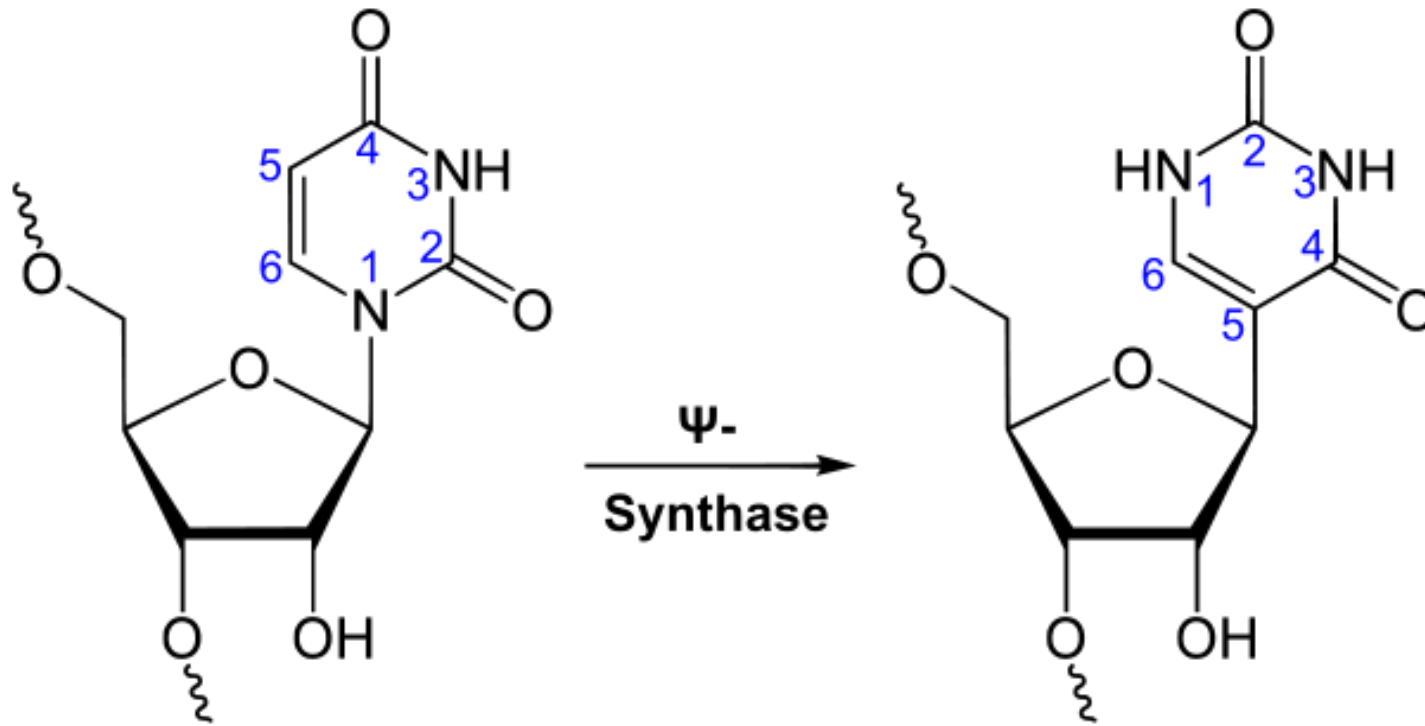
Processing of tRNAs in bacteria and eukaryotes.



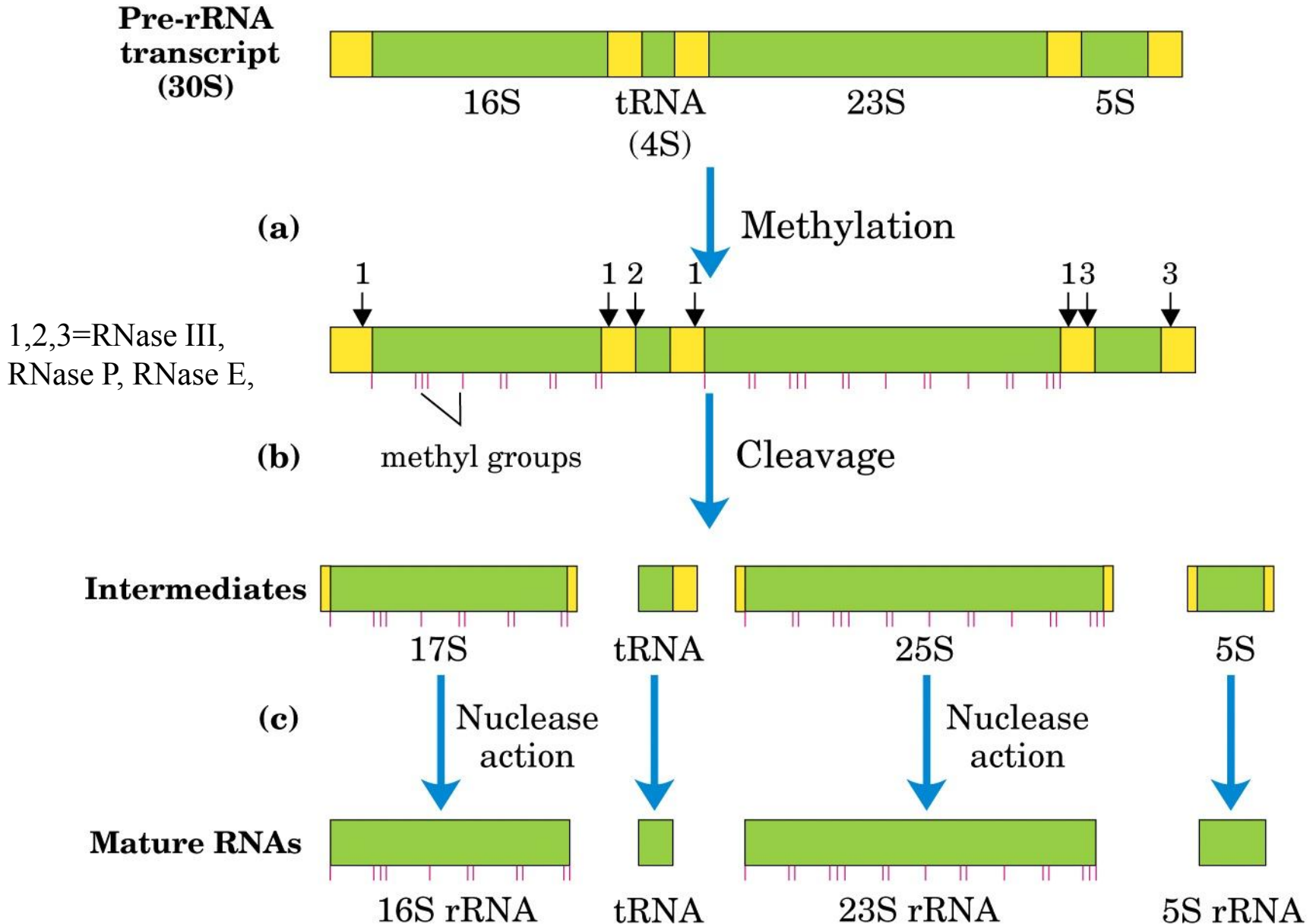
Some modified bases of rRNAs and tRNAs, produced in posttranscriptional reactions



It is commonly found in tRNA, associated with thymidine and cytosine in the TΨC arm and is one of the invariant regions of tRNA. The function of it is not very clear

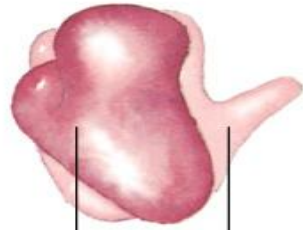


rRNA processing in Prokaryotes

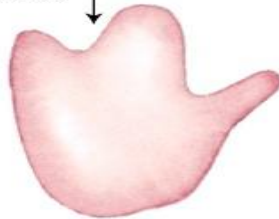


ALL rRNA and some tRNA = arise from a single 30S RNA precursor of about 6,500 nucleotides.

Bacterial ribosome
70S $M_r 2.7 \times 10^6$



50S



$M_r 1.8 \times 10^6$

5S rRNA
(120 nucleotides)
23S rRNA
(3,200 nucleotides)
36 proteins

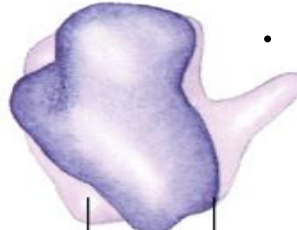


30S

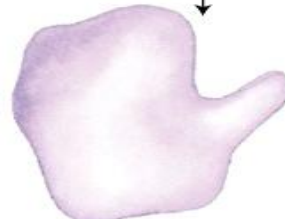
$M_r 0.9 \times 10^6$

16S rRNA
(1,540 nucleotides)
21 proteins

Eukaryotic ribosome
80S $M_r 4.2 \times 10^6$



60S



$M_r 2.8 \times 10^6$

5S rRNA
(120 nucleotides)
28S rRNA
(4,700 nucleotides)
5.8S rRNA
(160 nucleotides)
~ 49 proteins



40S

$M_r 1.4 \times 10^6$

18S rRNA
(1,900 nucleotides)
~ 33 proteins

(b)

in eukaryotes:rRNA processing and ribosome assembly are tightly coupled.

45S precursor



incorporated into a nucleolar 90S preribosomal complex,(cleavage and modification)



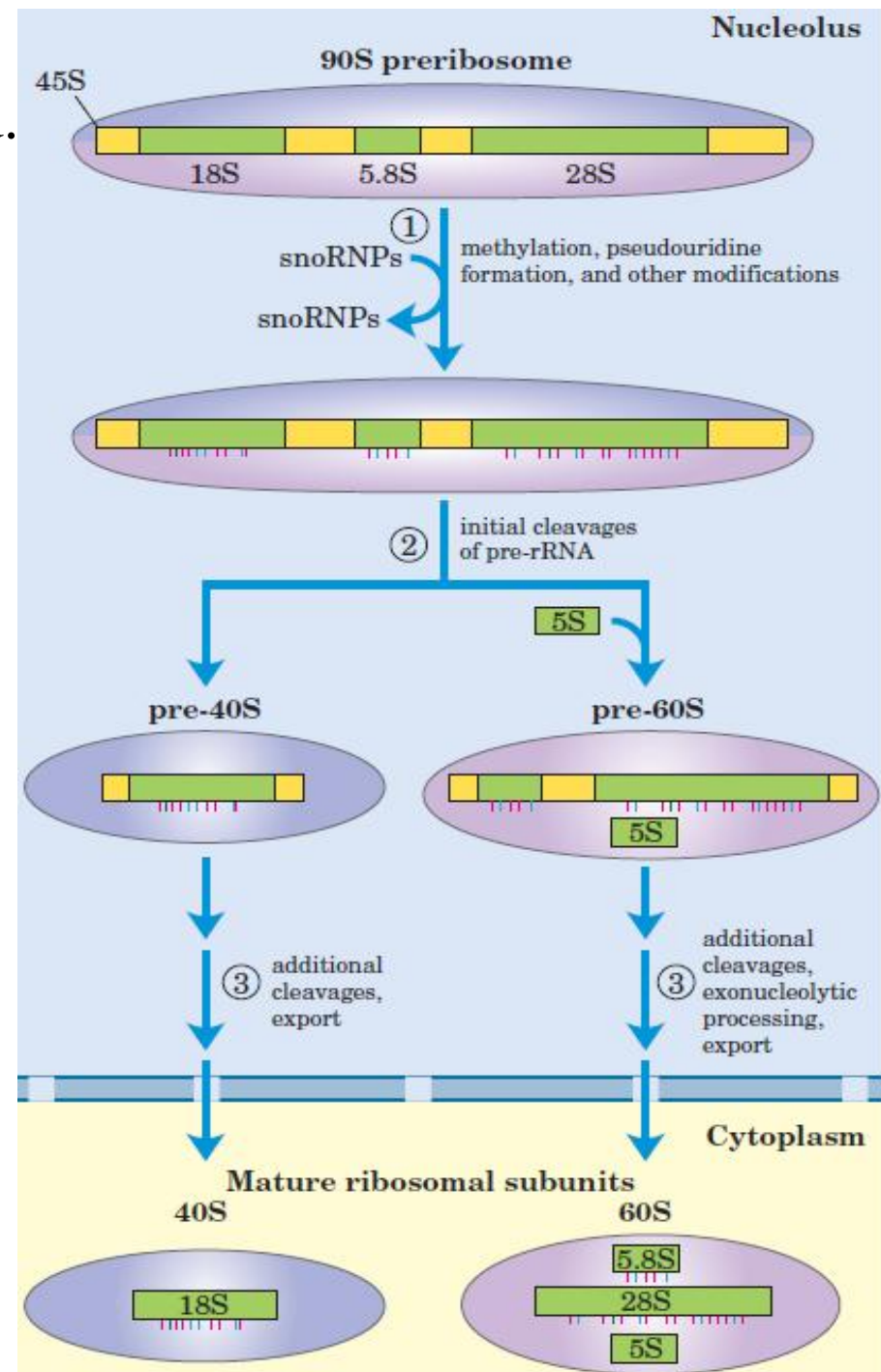
5S rRNA is produced separately.



Pre -ribosome assembly in the nucleolus.(nucleolus)



Mature ribosomal subunit(cytoplasm)



- **Ribozyme**, or RNA enzyme, is a RNA molecule that act as enzymes, often found to catalyze cleavage of either its own or other RNAs.
- Due to their complex secondary structures and hairpin/hammer head, RNAs could act as a catalyst and this idea was proposed by Carl Woese et al,
- It has also been found to catalyze the aminotransferase activity of the ribosome.

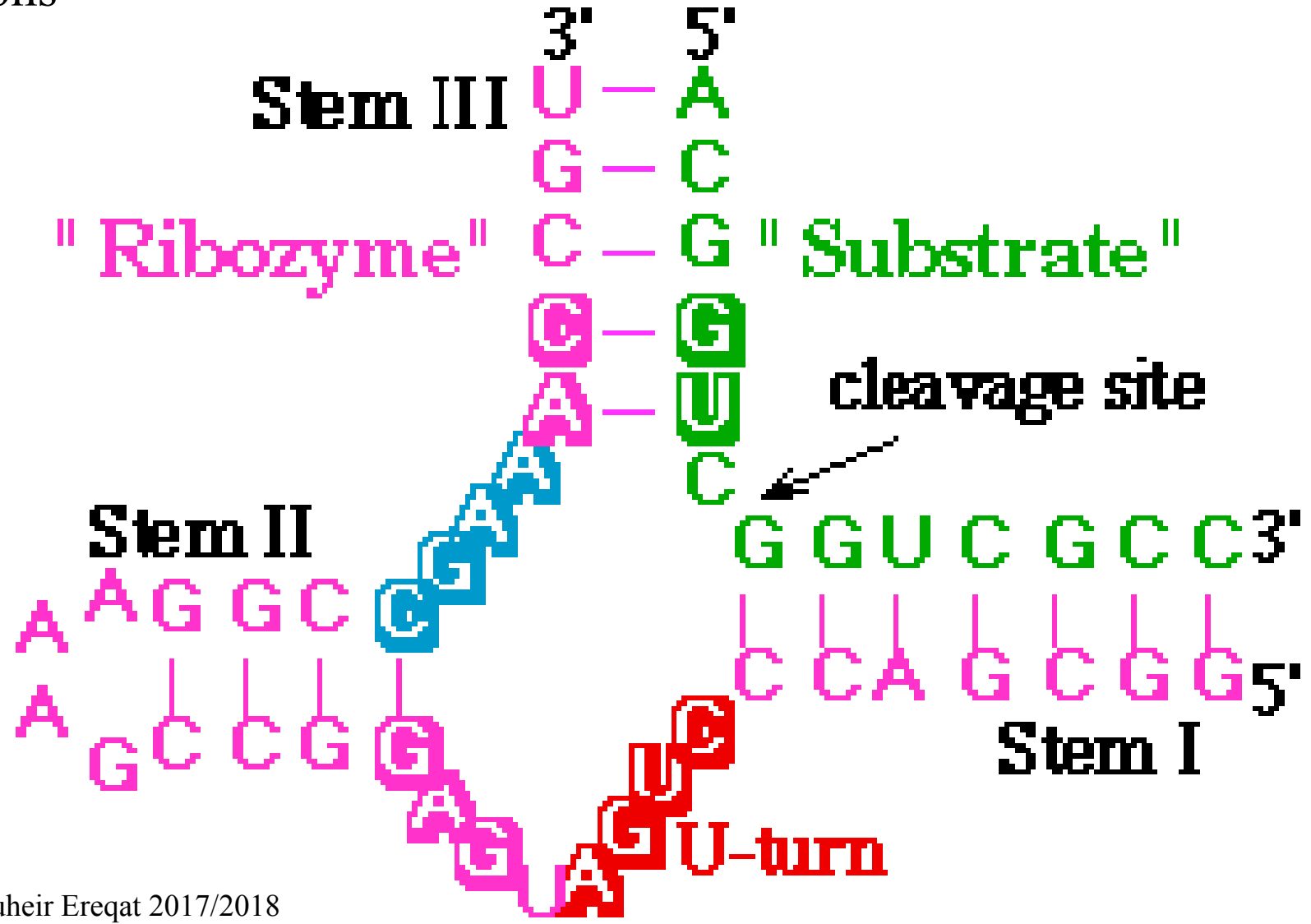
- The RNA catalysts called ribozymes are found in the nucleus, and mitochondria of **eukaryotic** organisms.
- Some viruses, including several bacterial viruses, also have ribozymes.
- Almost all ribozymes are involved in **processing RNA**.
- They act either as molecular scissors to cleave precursor RNA chains or as "molecular staplers" that **ligate** two RNA molecules together.
- BUT the ribosomal RNA is itself also a ribozyme.!!

Types of ribozymes

- Ribozymes may be classified into natural ribozymes and artificial ribozymes
- Natural ribozymes include:
 - Peptidyl transferase 23S rRNA, RNase P, Group I and Group II introns, Hammerhead ribozyme.....
- Artificial ribozymes are synthesized in the laboratory based on the dual nature of RNAs as a catalyst and an informational polymer

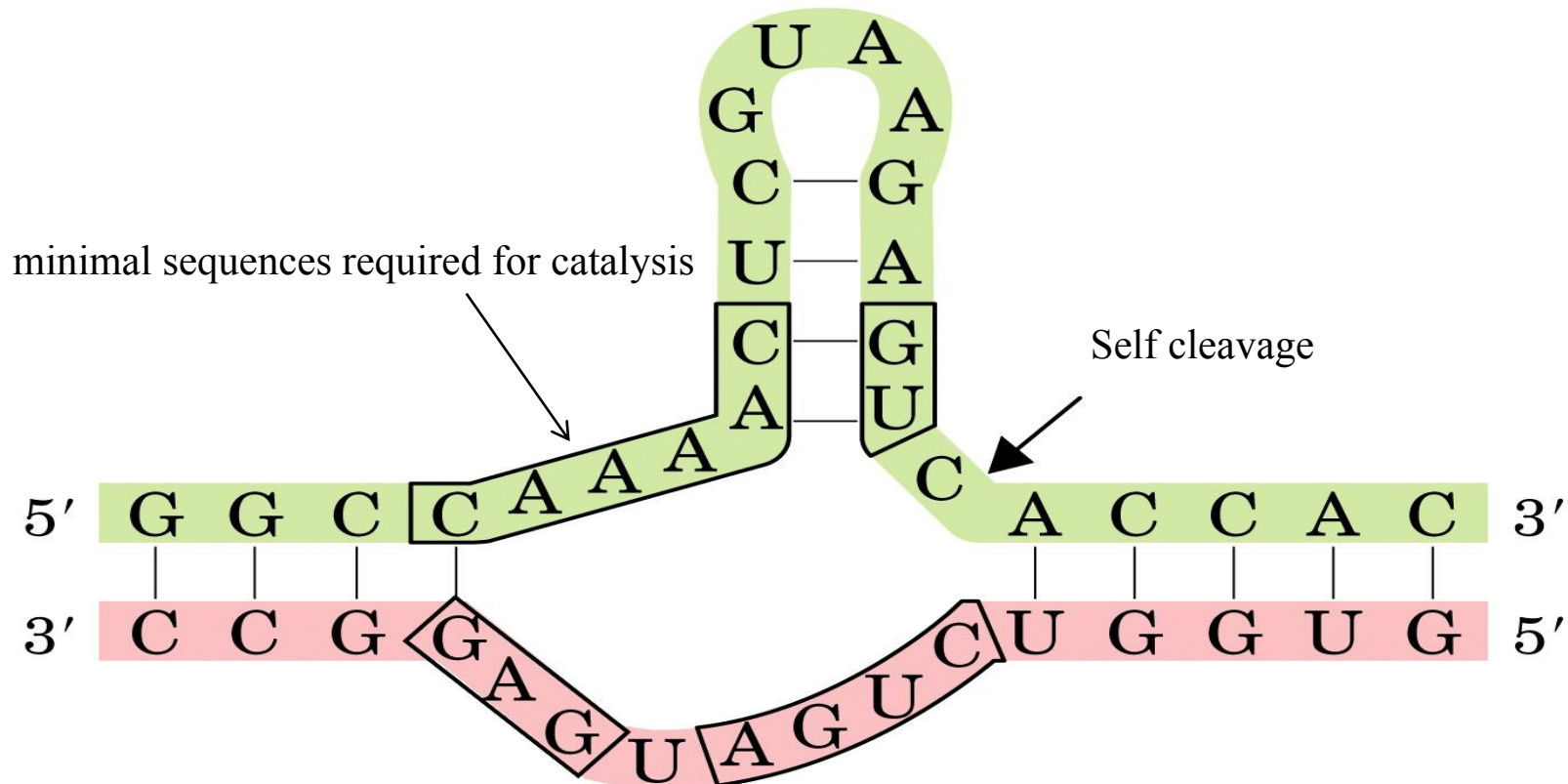
Hammerhead ribozyme : plant virus RNAs (plant viroid)

promote site-specific RNA cleavage reactions. It is a metalloenzyme; Mg²⁺ ions



Ribozymes (ribonucleic acid enzymes) = catalytic RNA

- Ribozymes are inactivated by heating above their melting temperature or by addition of denaturing agents or complementary oligonucleotides, which disrupt normal base-pairing patterns



Dr. Suheir Eregat 2017/2018

(a)

Concentration of RNA depends on:

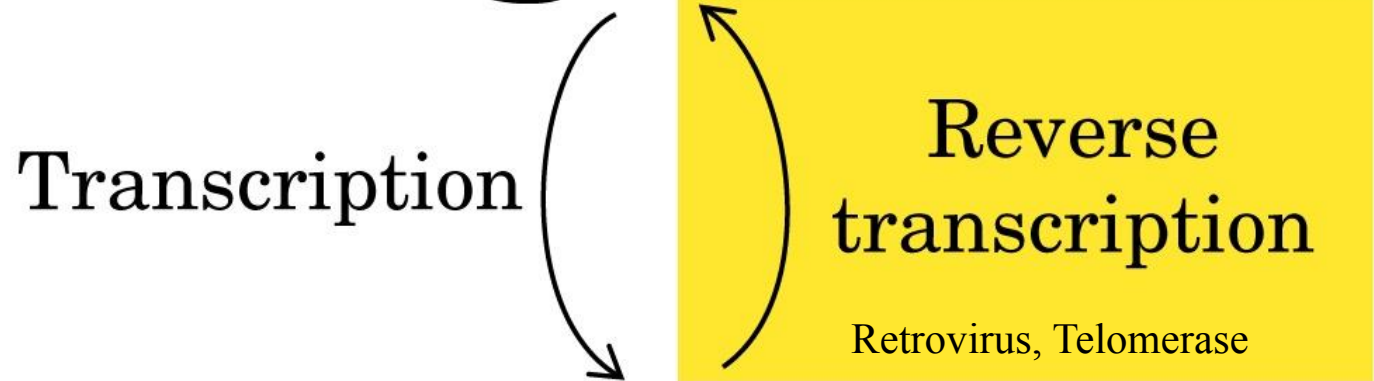
- 1) Rate of synthesis.
- 2) Rate of degradation. (ensures mRNA not build up in the cell)

Prokaryotes:

endoribonucleases and $3' \rightarrow 5'$ exoribonucleases.

Eukaryotes: shortening the poly A tail and decapping 5' end and $3' \rightarrow 5'$ exoribonuclease (10 types) = **exosome**

In lower eukaryotes $5' \rightarrow 3'$ exoribonuclease



RNA dependent RNA
polymerase = replicase



Some Viral RNAs Are Replicated by

Translation

Protein

Retroviral infection of a mammalian cell

