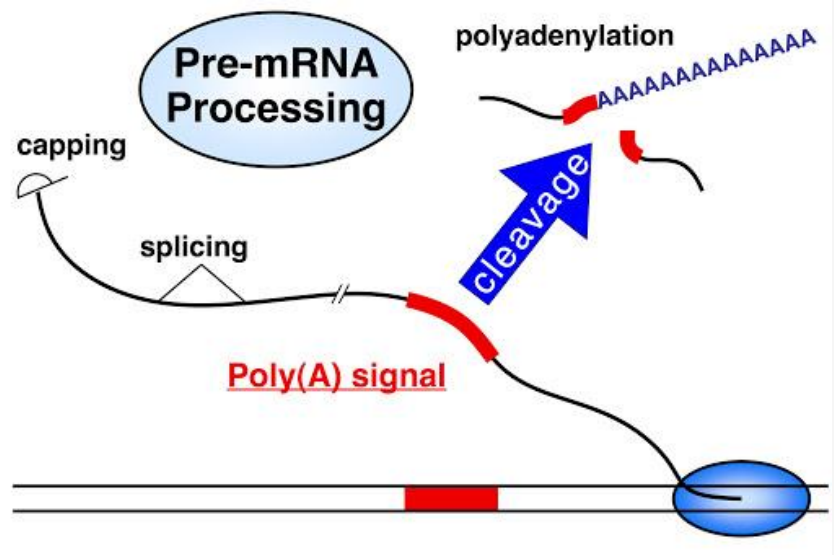
Polyadenylation



- While RNA Polymerase II is still transcribing downstream of the proper end of a gene, the pre-mRNA is cleaved by an endonuclease-containing protein complex between an AAUAAA consensus sequence and a GU-rich sequence.

- This releases the functional pre-mRNA from the rest of the transcript, which is still attached to the RNA Polymerase.

- An enzyme called poly (A) polymerase (PAP) is part of the same protein complex that cleaves the pre-mRNA and it immediately adds a string of approximately 200 A nucleotides, called the poly (A) tail, to the 3′ end of the just-cleaved pre-mRNA.

- The poly (A) tail protects the mRNA from degradation, aids in the export of the mature mRNA to the cytoplasm, and is involved in binding proteins involved in initiating translation.

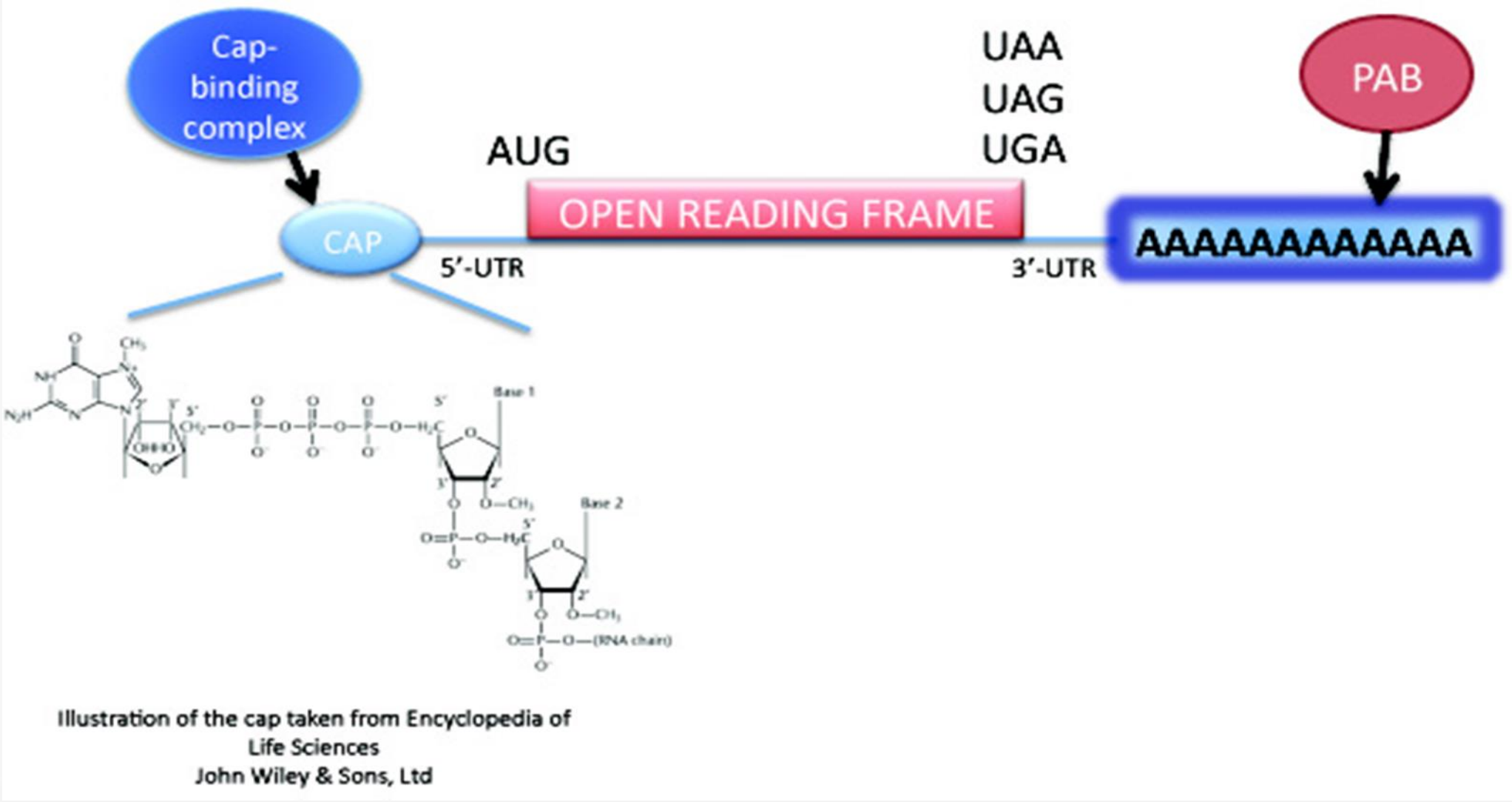


Illustration of the cap taken from Encyclopedia of Life Sciences
John Wiley & Sons, Ltd

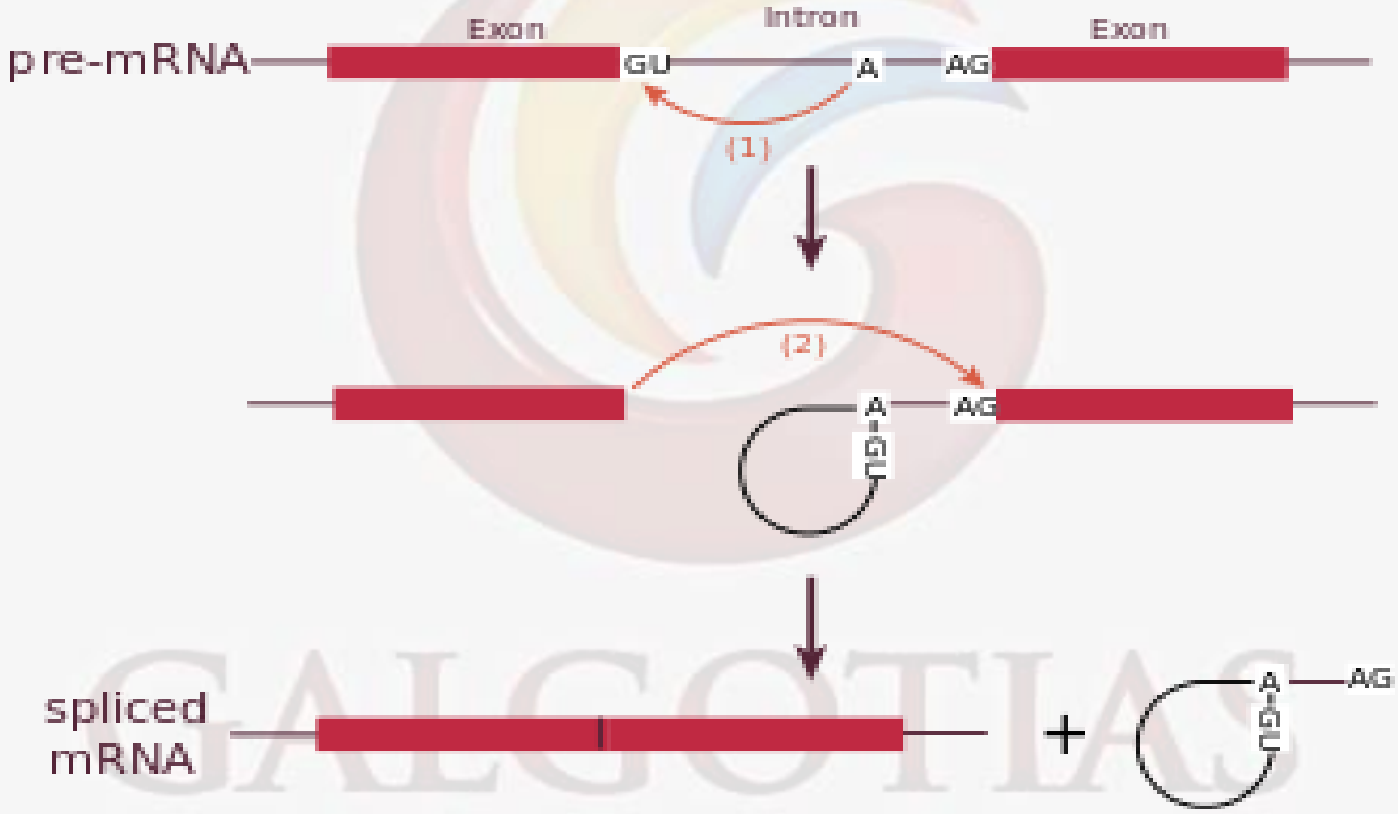
SPLICING

- The process by which introns are removed from hnRNA to produce mature messenger RNA that contains only exons.

- Eukaryotic pre-mRNAs typically include introns.

- Introns are removed by RNA processing in which the intron is looped out and cut away from the exons by snRNPs, and the exons are spliced together to produce the translatable mRNA.

- The steps of pre-mRNA splicing (intron removal) are as follows:
- The intron loops out as snRNPs (small nuclear ribonucleoprotein particles, complexes of snRNAs and proteins) bind to form the spliceosome.
- The intron is excised, and the exons are then spliced together.
- The resulting mature mRNA may then exit the nucleus and be translated in the cytoplasm.


pre-mRNA
Exon
Intron
Exon
GU
A
AG
(1)
(2)
A
AG
A-GU
spliced
mRNA
+
A
AG
A-GU

ALTERNATIVE SPLICING

- Alternative splicing is a method cells use to create many proteins from the same strand of DNA. It is also called alternative RNA splicing.

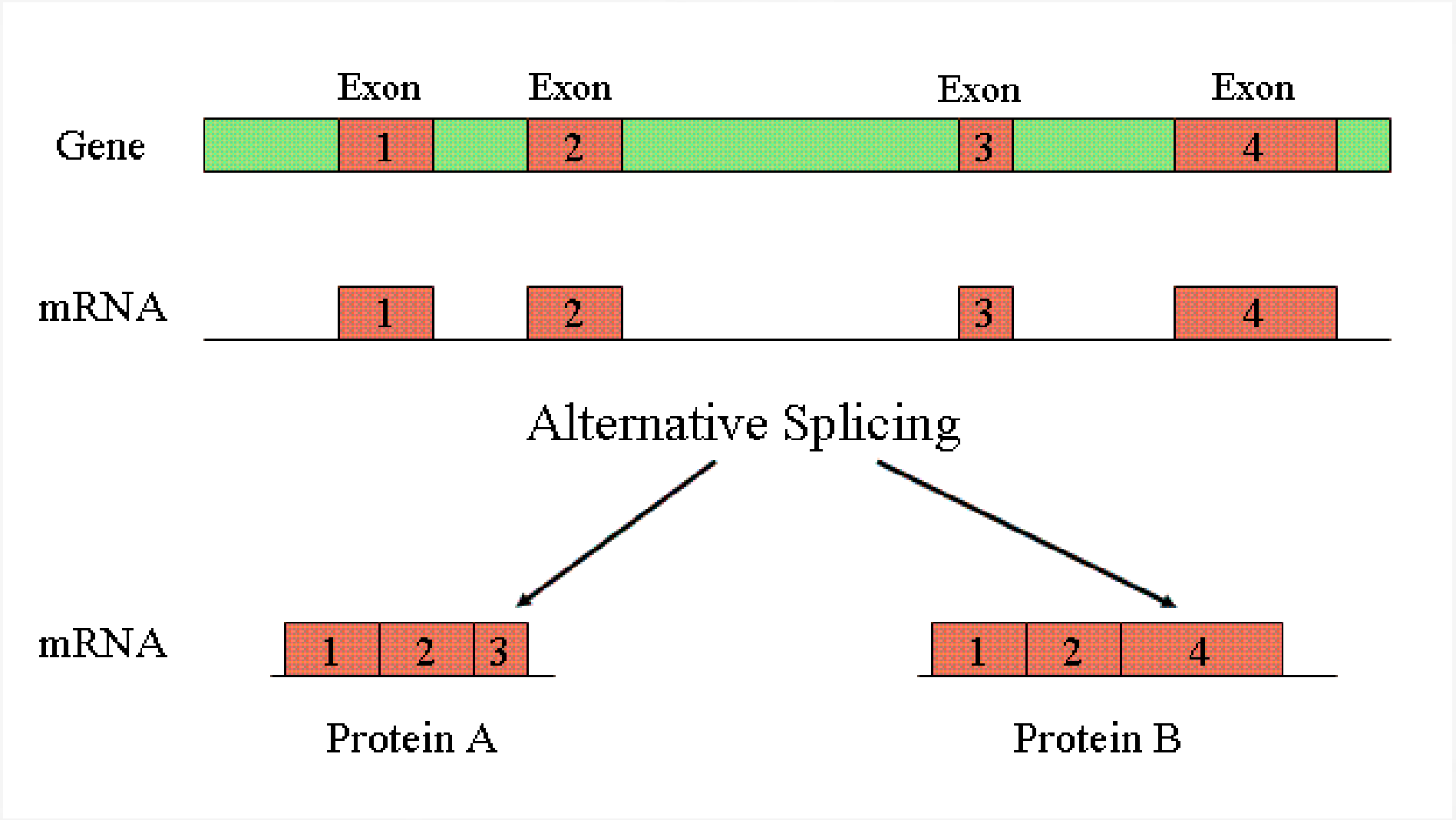
- In regular DNA translation, specialized proteins create messenger RNA (mRNA) from the DNA template.

- This mRNA then finds its way to a ribosome, where the RNA code is translated into the structure of a new protein.

- In alternative splicing, interactions between different proteins, the cell, and the environment can cause different segments of the original DNA to be omitted from the mRNA.

- When this happens, the alternate mRNA is translated into an entirely different protein.

- Using the method of alternative splicing, organisms can produce many more proteins than their DNA might indicate.


Exon
Exon
Exon
Exon
Gene
1
2
3
4
mRNA
1
2
3
4
Alternative Splicing
mRNA
1
2
3
1
2
4
Protein A
Protein B

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Thank you