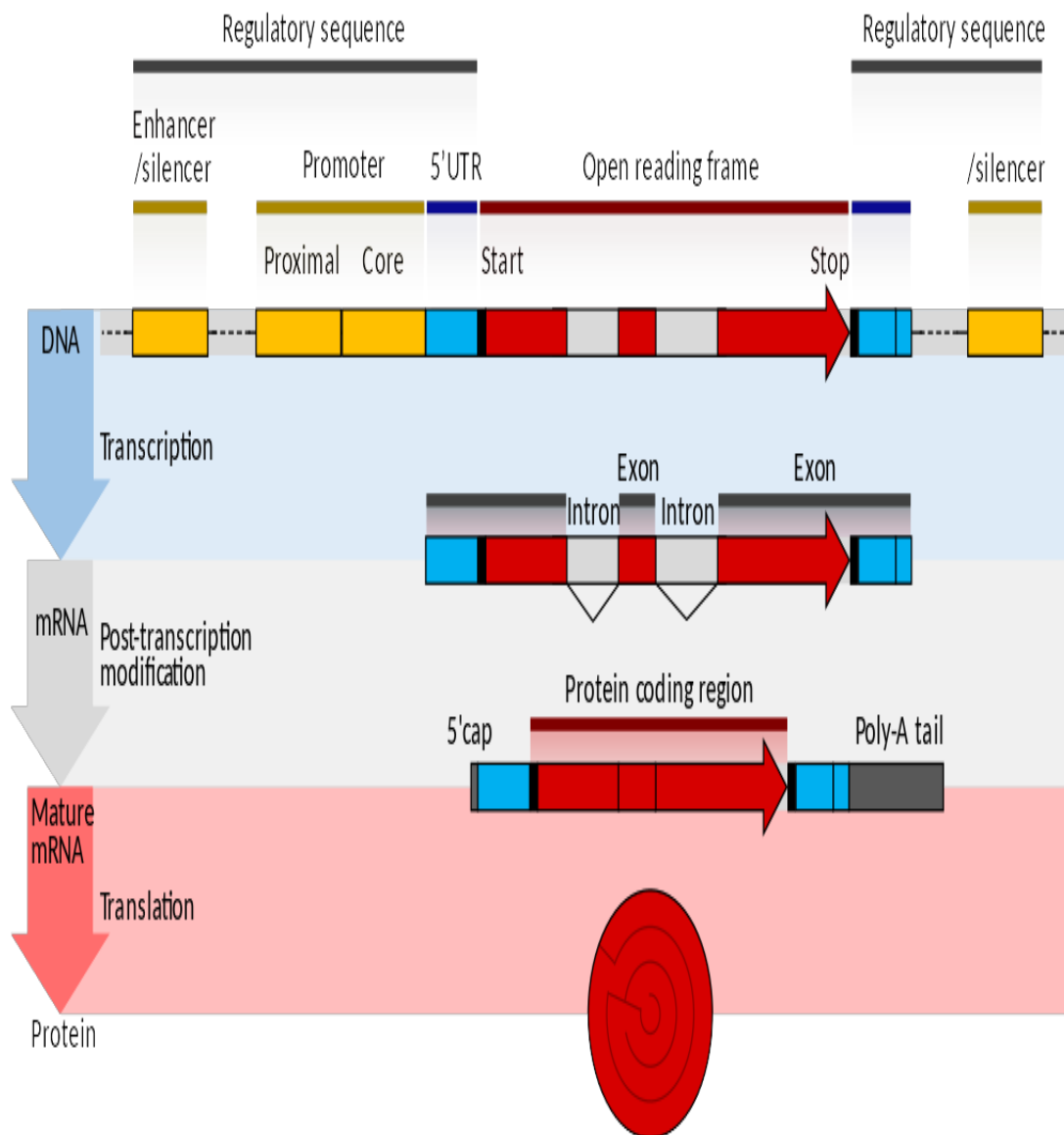


Eukaryotic Transcription

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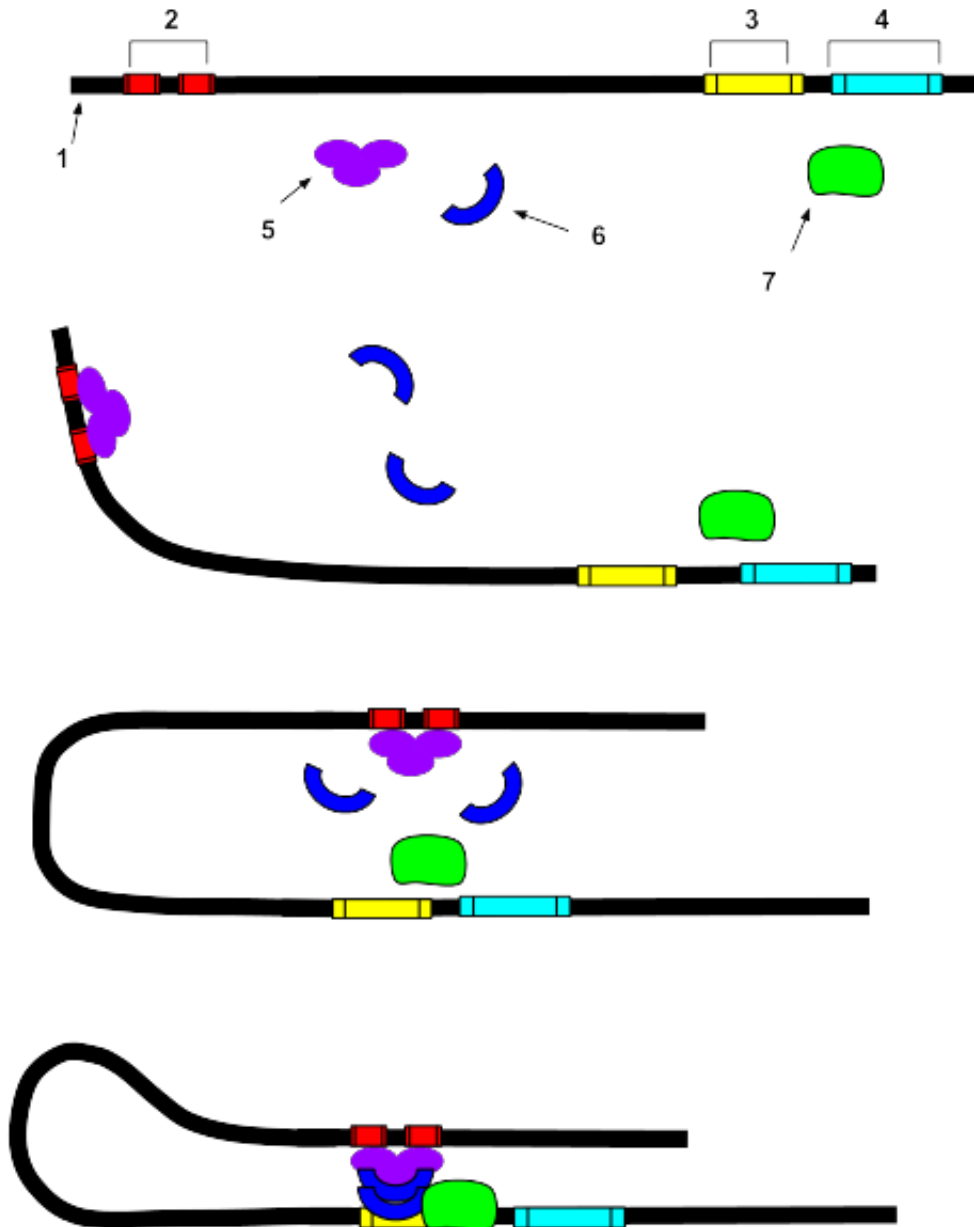
Eukaryotic gene expression



The Central Dogma in Eukaryotes. Genomic DNA of genes often contain introns that are spliced out when an RNA matures to a mRNA. This excision of introns can result in splice variants of the same gene with variants of the same protein.

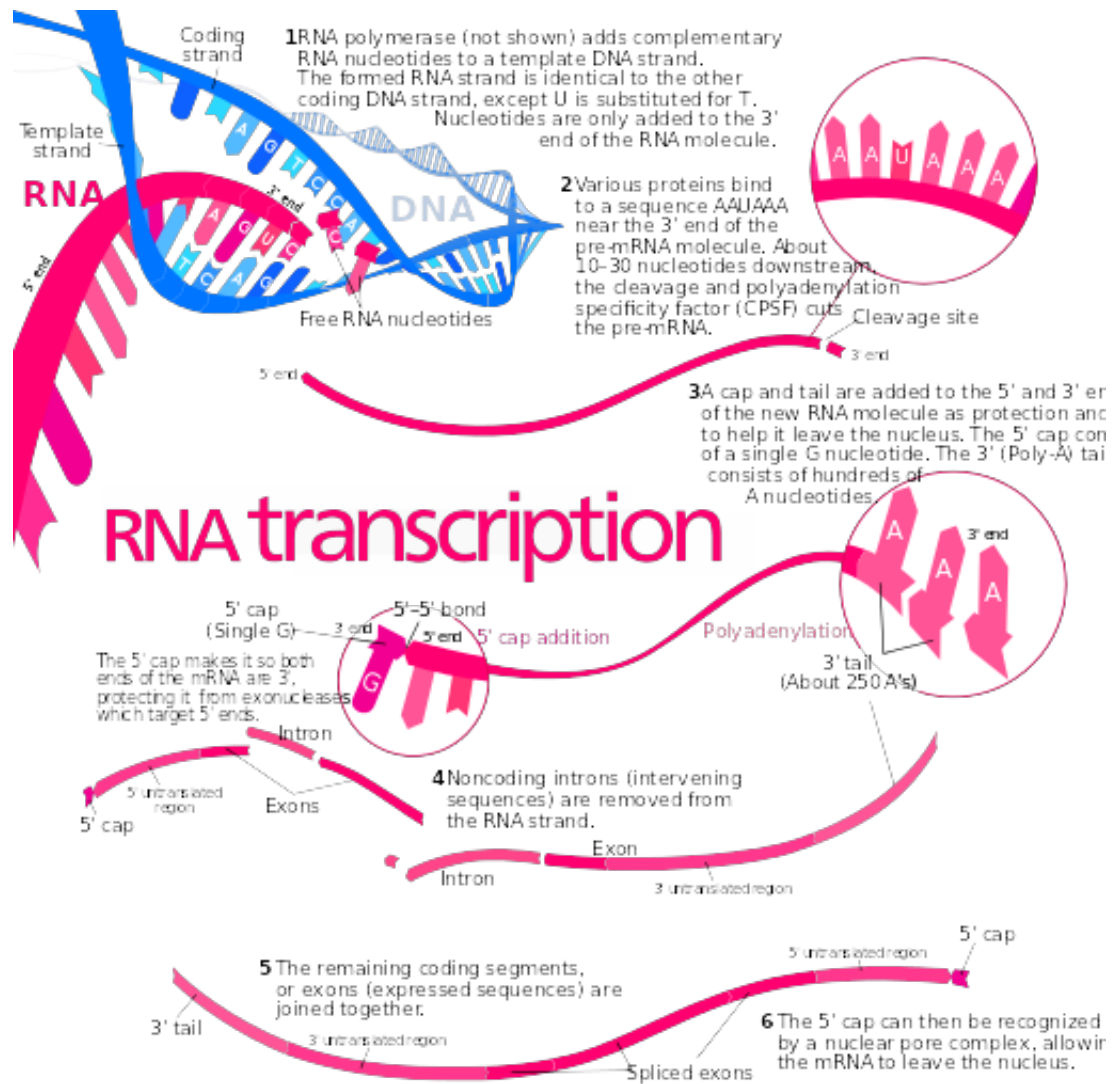
Unlike prokaryotic genes, expression of genes in eukaryotic cells have complex systems of

transcription factors that act on promoters to recruit RNA polymerases. Additionally, **enhancer elements** may reside many kilobase upstream of the promoter. These enhancers strengthen the transcription of the gene. In this case, **transcription activator proteins** or trans-activators augment the promoter activity.

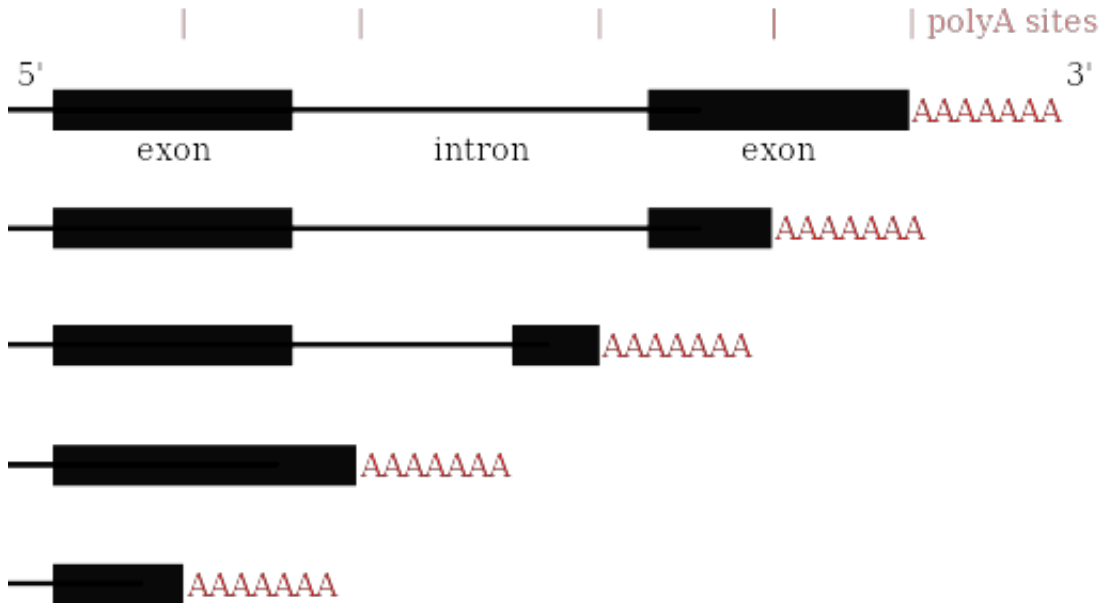


1. DNA 2. Enhancer 3. Promoter 4. Gene 5. Transcription Activator Protein 6. Mediator Protein 7. RNA Polymerase Mediator proteins (**coactivators**) form a multiprotein complex with the activators to recruit RNA polymerase to the promoter.

Eukaryotic mRNA



Eukaryotic genes may often contain **introns** (non-coding sequences) that are spliced out from the **exons** (coding sequences). This complexity permits for increased variety of gene products. Mature eukaryotic mRNAs contain a 5'-methyl-Guanine followed by an untranslated leader sequence (**5'-UTR**), the coding sequences (**cds**), a 3'-untranslated region (**3'-UTR**) and a long stretch of Adenines (polyA tail).



Expression is most easily measured with RNA since nucleic acid manipulation is fairly simple with 4 different nucleotides. In eukaryotes, the messenger RNA (mRNA) intermediate that is transcribed from DNA contains a polyA tail that is used to separate these messages from other types of RNA that are abundant within cells (like ribosomal RNA). Through the use of an enzyme called **reverse transcriptase** (RT) and primers composed of deoxy-Thymidines (**oligo-dT** or dT₁₈), mRNA can be converted into a single strand of DNA that is complimentary to the mRNA. This complimentary DNA is called **cDNA**. cDNA is very stable compared to the highly labile mRNA and is used for subsequent processing.

Advanced Video of Eukaryotic Transcription Regulation

The first video describes the discovery of transcription factors that regulate the expression of eukaryotic genes.

The second video describes the complexity of gene expression that involve chromatin remodeling and enhancers. This video explores the the roles and outcomes of differential gene expression.

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