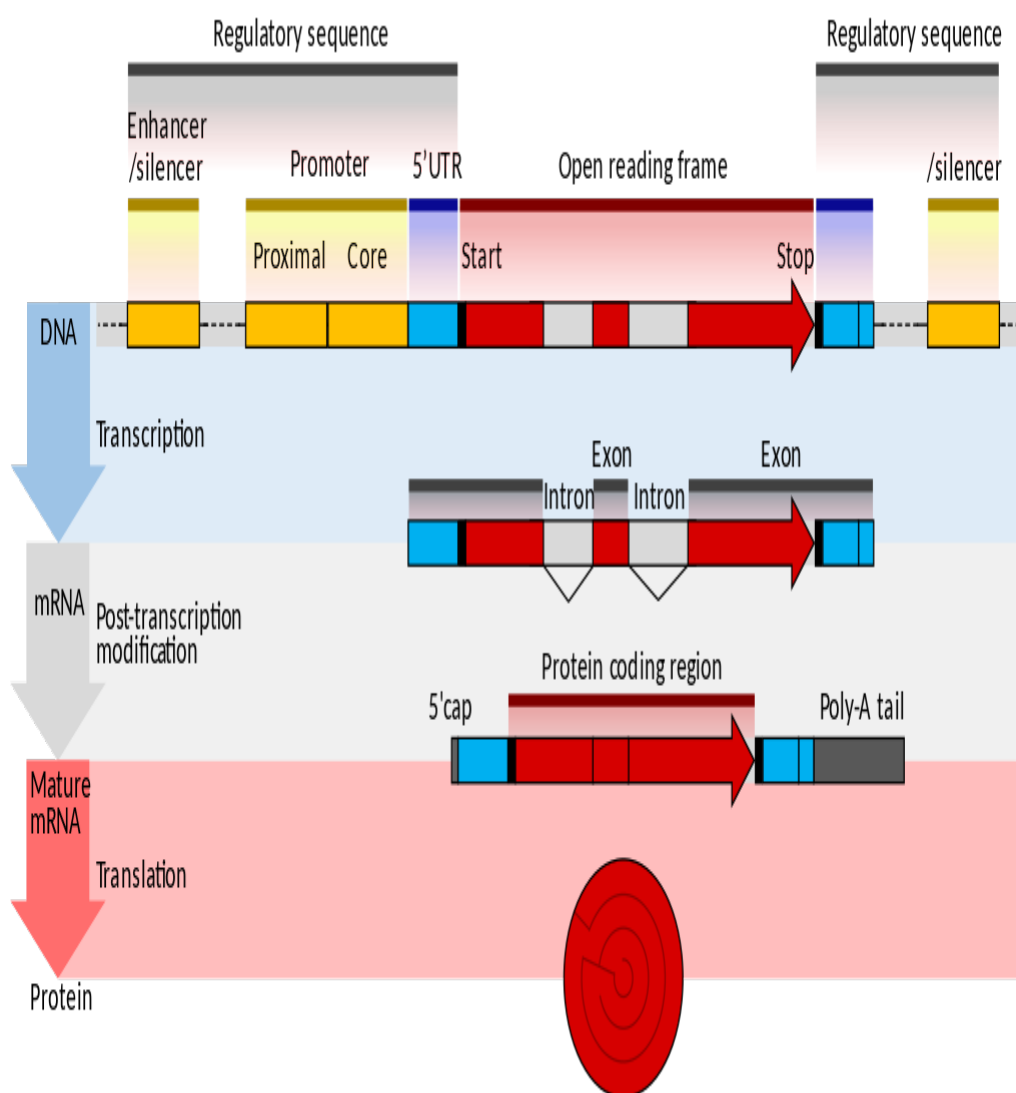




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Eukaryotic gene expression

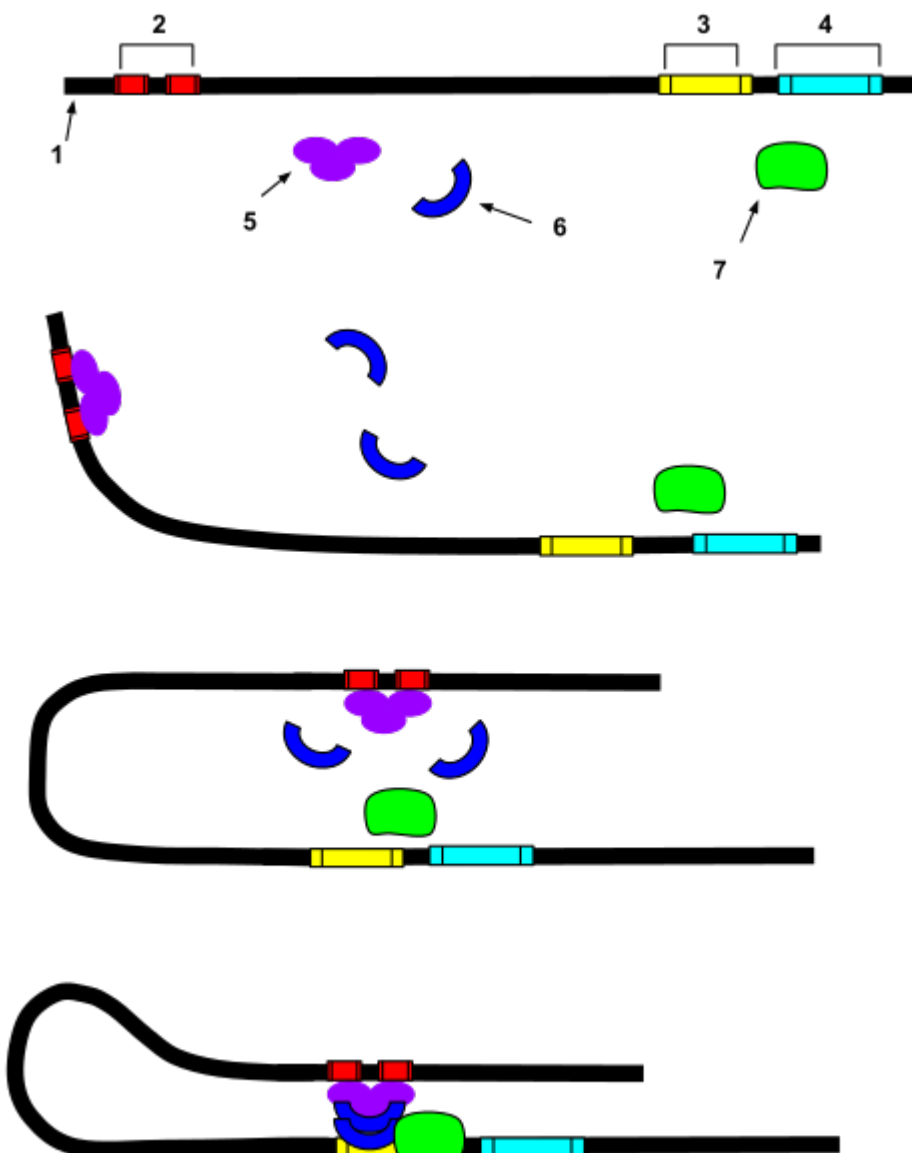


The Central Dogma in Eukaryotes. Genomic DNA of genes often contain introns that are spliced out when an RNA matures to a mRNA. This excision of introns can result in splice variants of the same gene with variants of the same protein. *Credit: Thomas Shafee (CC-BY 4.0)*



Eukaryotic Transcription

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.

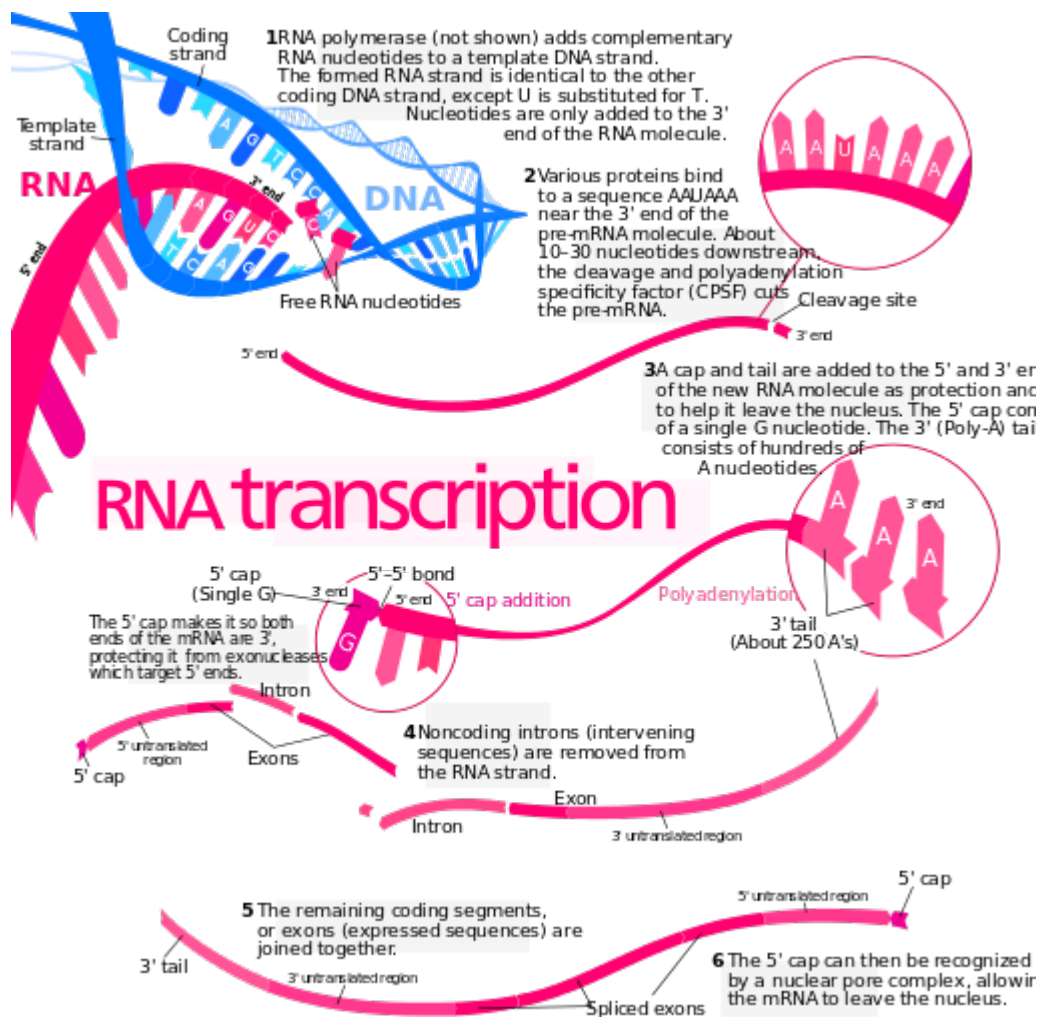


1. DNA 2. Enhancer 3. Promoter 4. Gene 5. Transcription Activator Protein 6. Mediator Protein 7. RNA Polymerase Credit: Jon Cheff (CC-BY-SA 4.0)



Mediator proteins (**coactivators**) form a multiprotein complex with the activators to recruit RNA polymerase to the promoter.

Eukaryotic mRNA

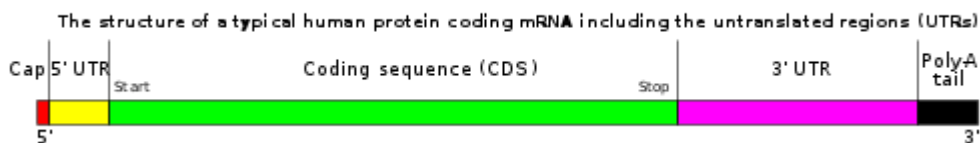
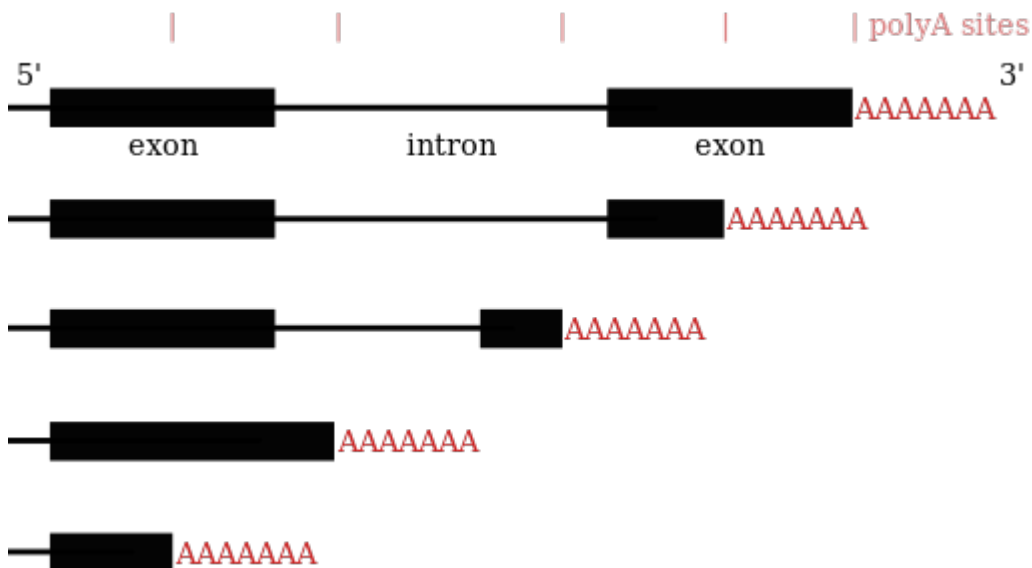


Credit: Kelvinsong (CC-BY-3.0)

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).



Eukaryotic Transcription



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 dT_{18}), 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.

Tags: [integration of knowledge](#)