1 | DNA Transcription

The process of DNA transcription is done by the RNA Polymerase Enzyme. DNA transcription begins by ripping apart hydrogen bonds using DNAse enzyme, then the RNA polymerease reads one side (the ”template strand”, a.k.a. noncoding ”antisene” strand that runs from 3’ to 5’) of the double helix, recognizing each nucleotide.

The point of transcription is to recognize the series of promoters that code for a gene and copying them into the appropriately matching mRNA.

Geneinformation that successfully encodes a functional protein or a functional catalytic RNA => ”Promoter”s denotes beginning of a gene. ”Terminator”s denotes the end of gene.

1.1 | Starting Transcription

1. Series of utility ”factors” proteins begin to assemble at the promoter which signals transcription to call the attention of RNA polymerase. One such signaling factors is the KBhBIO101TATABinding.
2. RNA polyamerase binds to the Sigma Subunit => form a holoenzyme to unwind DNA — creates a **transcription bubble**
3. Sigma subunit informs the enzyme where to find a promoter (beginning of binding)
4. ”Enhancer” gene sequences help bind with activator proteins to help attract RNA polymerase II

Promoters Promoters are the signaling devices that mark the beginning of a nucleotide in a gene. The strength of promoters could be modulated to create different rates of transcription. Stronger promoters/enhancers => ”enhance” ”more.” i.e. tumor viruses strengthen promoters for cell growth

1.2 | Controlling Transcription

(This applies only to promoters, #disorganized, we have yet to get to this process in Eukaryotes)

Between the promoter and the actual coding DNA, there is a region named *operator* that allows three types of regulatory molecules to bind to it to alter how the gene is transcribed, namely:

- **Repressors**: proteins that suppress transcription
- **Activators** are proteins that increase the transcription
- **Inducers** catalyses repressors or activators — making either a strenthened activation or repression acting in conjunction with the other regulator

1.3 | Actually transcribing

The RNA Polymerase Enzyme starts at a promoter (typically found upstream of the 5’ start site) and ends at a terminator.

- A Box of TATAAT highlights transcription rate and the start site
- TFIIA cofactor in RNA (polymerease?) recognizes TATAAT box, TFIIB recognizes C/CG/CG/CGCCC upstream

The RNA ploymerease will pluck the correct corresponding nucleotide out of the nucleus to form the antiparallel mRNA sequence.

- G->C
- C->G
- A->*U*
- T->A

1.4 | Finishing Transcription

Transcription finishes at a gene **terminator**. This sequence will signals the end of the gene sequence that codes for a protein.

- Two types in prokaryotes
  - Rho-independent terminators — roll back onto itself, causing the RNA to terminate and mRNA to be release
  - Rho-dependent terminators — activate cofactor named rho + unwind the transcribed RNA-DNA hybrid
- In Eukarotes
  - Pol I genes — transcription stopped through termination factor by unwindng the transcribed RNA-DNA hybrid
  - Pol II genes — don't stop until the end, but a polymerase has a "cleavage" mechanism that clips the end out using a poly(A) tail consensus sequence