

# Chapter 17.

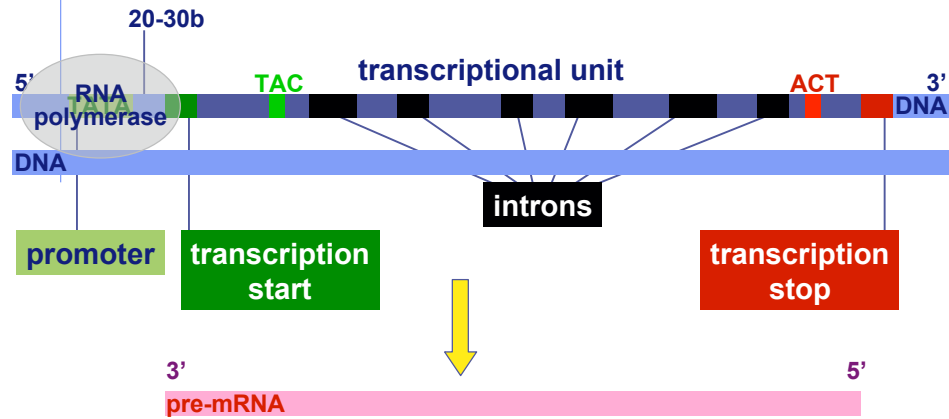
## RNA Processing



## **Transcription -- more details**

- **The process of transcription includes many points of control**
  - ◆ where to start reading DNA
  - ◆ where to stop reading DNA
  - ◆ editing the mRNA
  - ◆ protecting mRNA as it travels through cell

# The Transcriptional unit



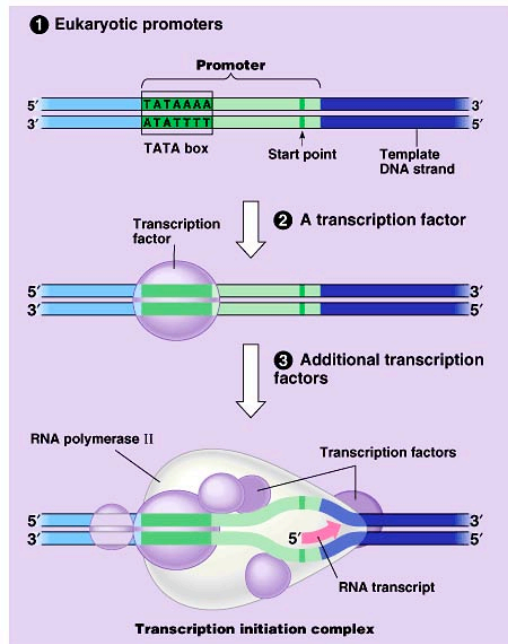
## Transcription controls

- **Promoter**
  - ◆ TATA box
  - ◆ where RNA polymerase attaches to DNA
- **Transcription start**
  - ◆ where RNA polymerase starts transcribing DNA
- **Transcription stop**
  - ◆ where RNA polymerase stops transcribing DNA
- **Pre-mRNA**
  - ◆ initial product of transcription

## Transcription factors

- ◆ proteins which bind to DNA & turn on or off transcription
- ◆ “master regulators”
  - genes controlling development

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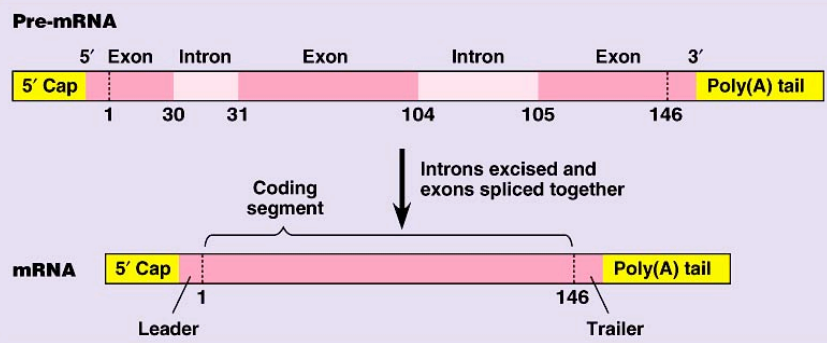
“Master regulator” transcription factors turn on or off multiple genes at once because all these genes would have the same binding sequence near their promoter. The “master regulator” proteins would bind to all of these genes and regulate all of them simultaneously.

This is what creates the bizarre mutations like legs on the heads of flies where antennae should be.

## Primary transcript

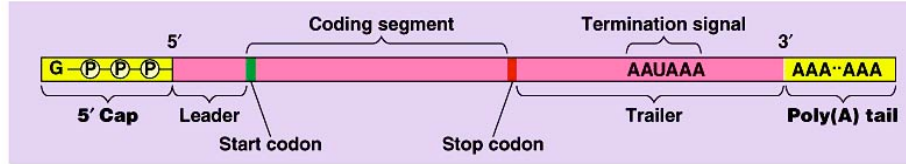
### ■ Processing mRNA

- ◆ protecting RNA from RNase in cytoplasm
  - add 5' cap
  - add polyA tail
- ◆ remove introns



## Protecting RNA

- **5' cap added**
  - ◆ modified G (GTP)
  - ◆ protects mRNA
    - from RNase (hydrolytic enzymes )
- **3' poly-A tail added**
  - ◆ 50-250 A's
  - ◆ protects mRNA
    - from RNase (hydrolytic enzymes )
  - ◆ helps export of RNA from nucleus



## Dicing & splicing mRNA

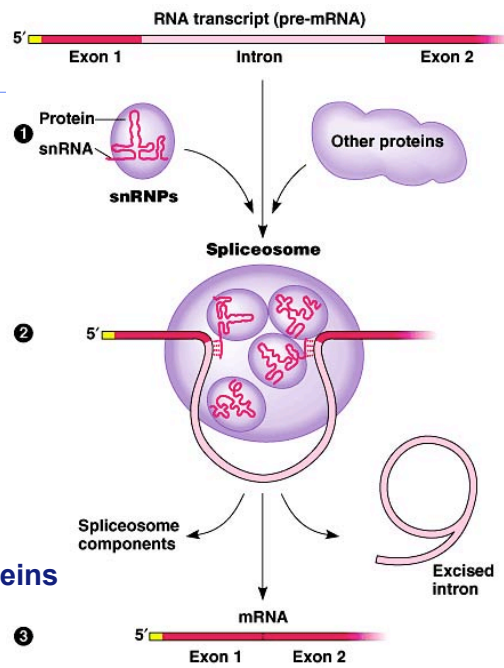
- **Pre-mRNA → mRNA**
  - ◆ edit out **introns**
    - intervening sequences
  - ◆ splice together **exons**
    - expressed sequences
  - ◆ In higher eukaryotes
    - 90% or more of gene can be intron
    - no one knows why...yet
      - ◆ **there's a Nobel prize waiting...**

## snRNPs

- **Spliceosome**
  - ◆ recognize splice sites
  - ◆ ribozymes catalyze process

small nuclear ribonucleoproteins

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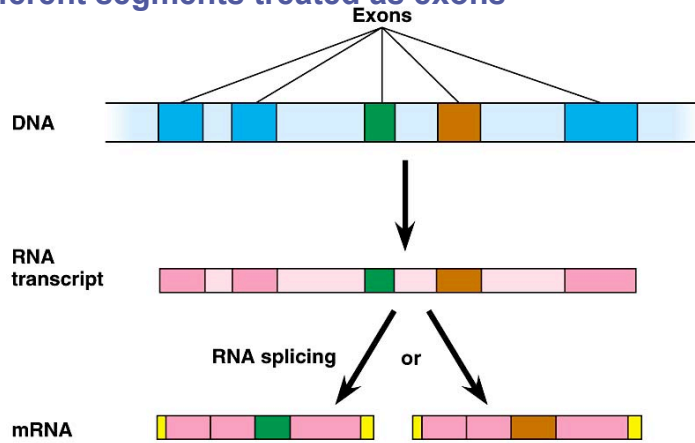
## Splicing details

- **No room for mistakes!**
  - ◆ editing & splicing have to be exactly accurate
  - ◆ a single base added or lost throws off the reading frame

# Alternative splicing

- Alternative mRNAs produced from same gene
  - ◆ when is an intron not an intron...
  - ◆ different segments treated as exons

hard to  
define  
a gene!

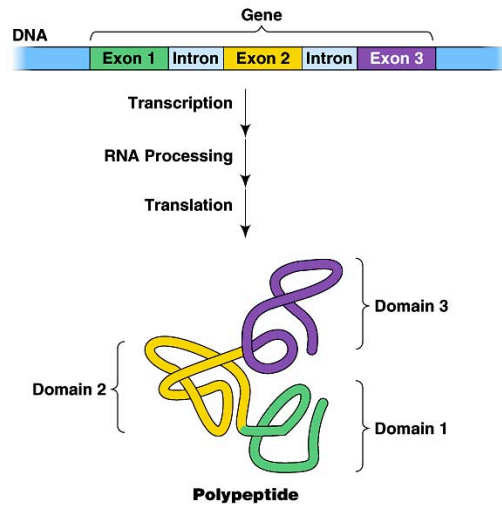


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# Domains

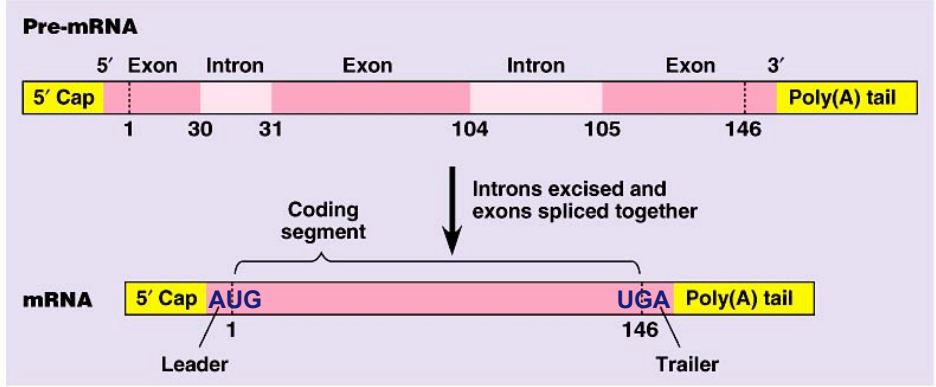
- **Modular architecture of many proteins**

- ◆ discrete functional & structural regions
- ◆ coded by different exons



# mRNA

## ▪ Mature mRNA



## The “Central Dogma”

- flow of genetic information within a cell

