

# Advanced Cell Biology. Lecture 17

Alexey Shipunov

Minot State University

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# Outline

## Questions and answers

### From DNA to RNA

Prokaryotic transcription

Eukaryotic transcription

RNA processing

RNA splicing

# Outline

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### From DNA to RNA

- Prokaryotic transcription

- Eukaryotic transcription

- RNA processing

- RNA splicing

## Previous final question: the answer

If you see a male tricolored cat, what does it mean genetically?

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- ▶  $X(X)_nY$

# From DNA to RNA

## Prokaryotic transcription

# Promoter and terminator sequences

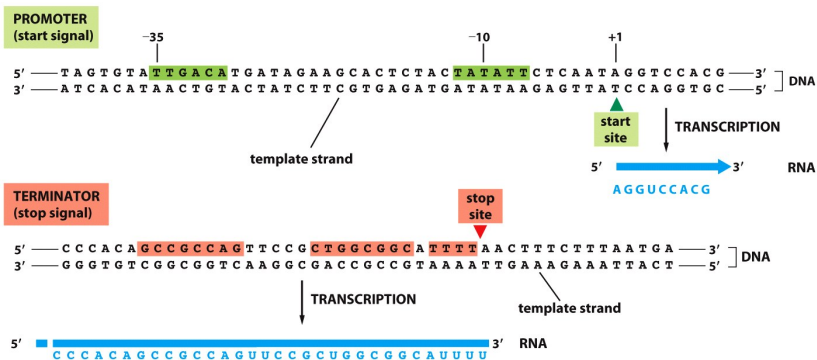


Figure 7-10 Essential Cell Biology 3/e (© Garland Science 2010)

## Directions of transcription

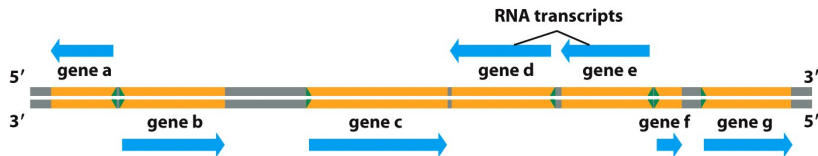


Figure 7-11 Essential Cell Biology 3/e (© Garland Science 2010)



# From DNA to RNA

## Eukaryotic transcription

## Eukaryotic transcription: differences

- ▶ Multiple polymerases: I (rRNA genes), II (tRNA genes, 5S rRNA gene) and III (other genes)
- ▶ General transcription factors
- ▶ DNA is much bigger and more compactized

## Eukaryotic RNA polymerase II movie

## Transcription factors

- ▶ TFIID recognizes TATA box
- ▶ TFIIB binds to it as well
- ▶ TFIIE, TFIIF and especially TFIIH will help RNA polymerase II to start transcription

## Transcription factors movie

## Transcription factors (1)

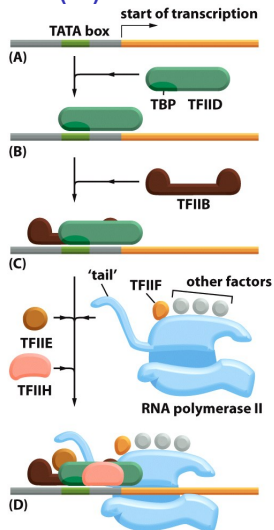


Figure 7-12 part 1 of 2. Essential Cell Biology 3/e (© Garland Science 2010)

## Transcription factors (2)

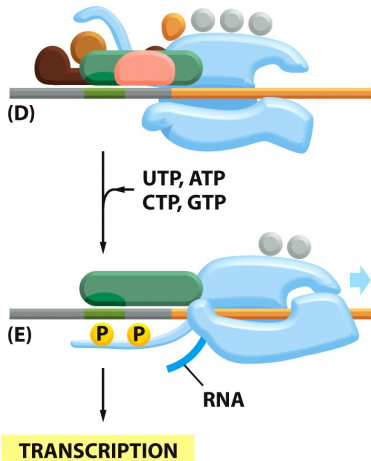


Figure 7-12 part 2 of 2 Essential Cell Biology 3/e (© Garland Science 2010)

# From DNA to RNA

## RNA processing



## RNA processing

- ▶ RNA capping: adds methylated G to 5' end of RNA (occurs before transcription completes)
- ▶ RNA polyadenylation: adds poly-A tail to 3' end of mRNA
- ▶ Increase stability, make mRNA recognizable from other RNAs

## RNA processing

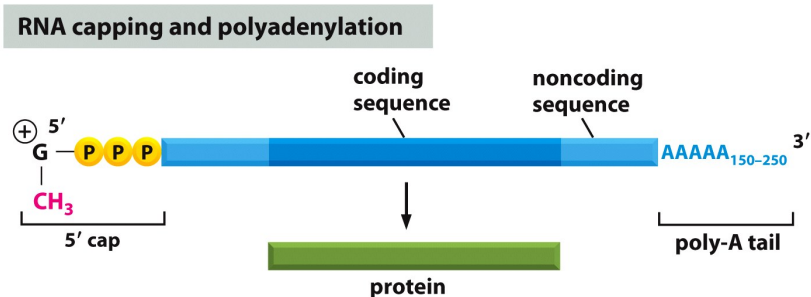


Figure 7-16a Essential Cell Biology 3/e (© Garland Science 2010)

# From DNA to RNA

## RNA splicing

## Introns and exons

- ▶ Non-coding sequences are introns (vary from 1 to 10,000 bp)
- ▶ Other are exons

## Introns and exons

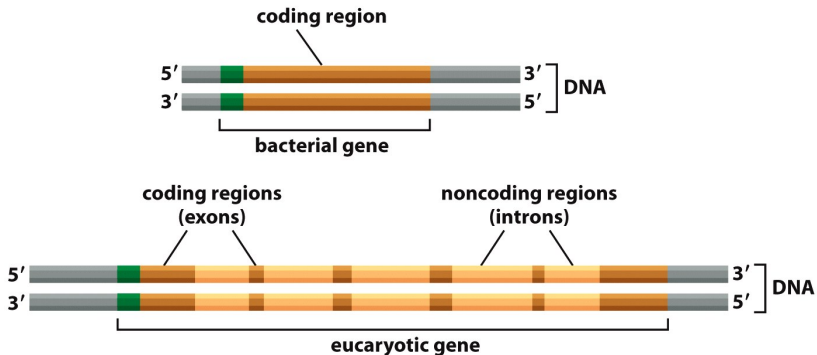


Figure 7-17 Essential Cell Biology 3/e (© Garland Science 2010)

## RNA splicing

- ▶ Introns should be removed from RNA: this is splicing
- ▶ RNA-protein complexes snRPNS (“snurps”) recognize the starts and ends of introns
- ▶ Snurps are core part of spliceosome
- ▶ Introns form lariat structures when spliced

## RNA splicing

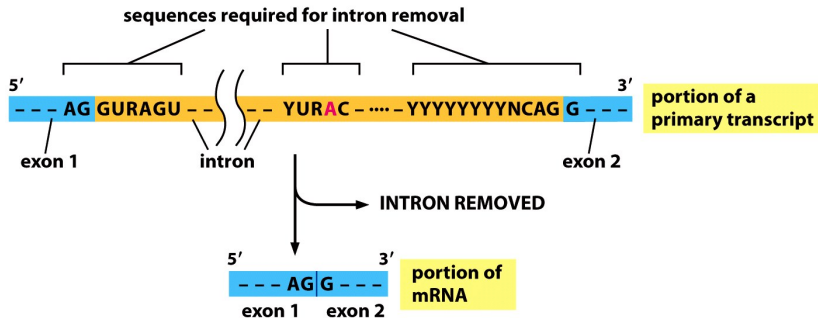


Figure 7-19 Essential Cell Biology 3/e (© Garland Science 2010)

RNA splicing movie



## Alternative splicing

- ▶ One RNA may be spliced differently
- ▶ Every single result of splicing will be the different protein

## Alternative splicing

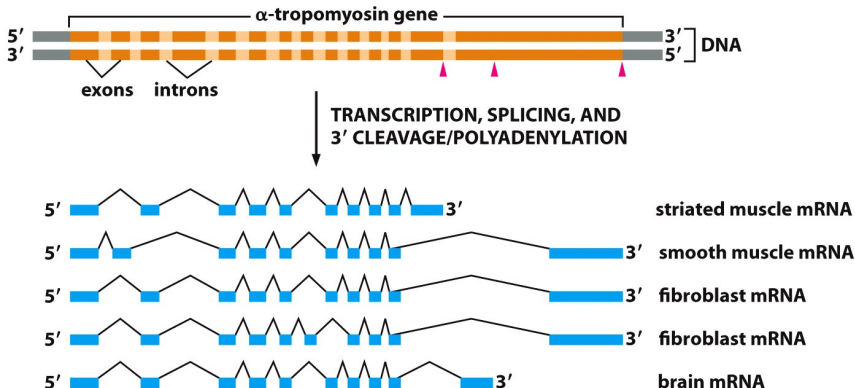


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## Final question (2 points)

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How RNA polymerase recognizes the “proper” strand of DNA?

## Summary

- ▶ Asymmetric promoters determine which DNA strand will be template and in which direction transcription will go
- ▶ Transcription processes are seriously different between prokaryotes and eukaryotes

## For Further Reading



A. Shipunov.

*Advanced Cell Biology* [Electronic resource].

2011—onwards.

Mode of access: [http:](http://)

[//ashipunov.info/shipunov/school/biol\\_250](http://ashipunov.info/shipunov/school/biol_250)



B. Alberts et al.

*Essential Cell Biology*. 3rd edition.

Garland Science, 2009.

*Chapter 7.*