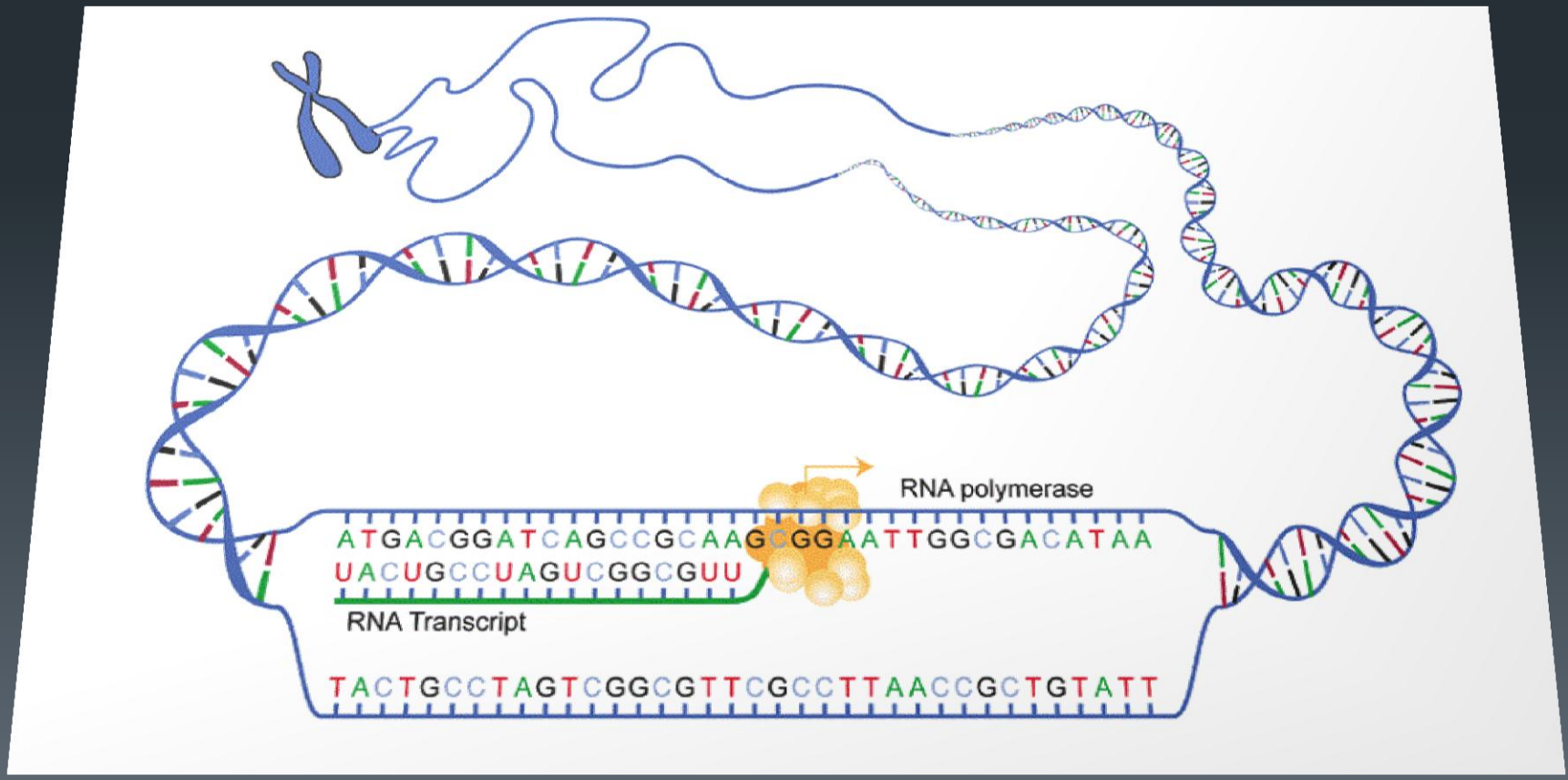
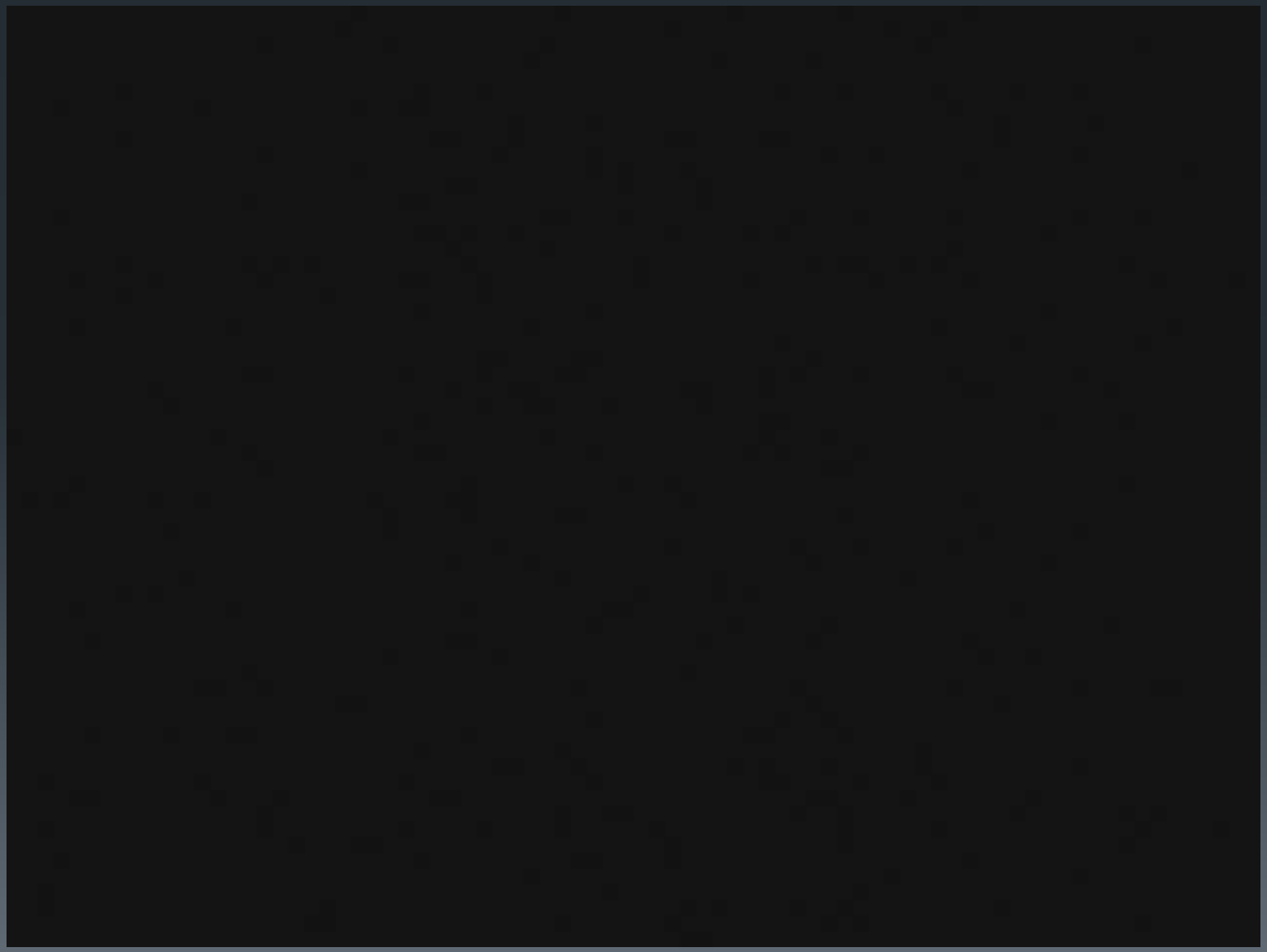
Protein Synthesis - Transcription



DNA codes for Proteins

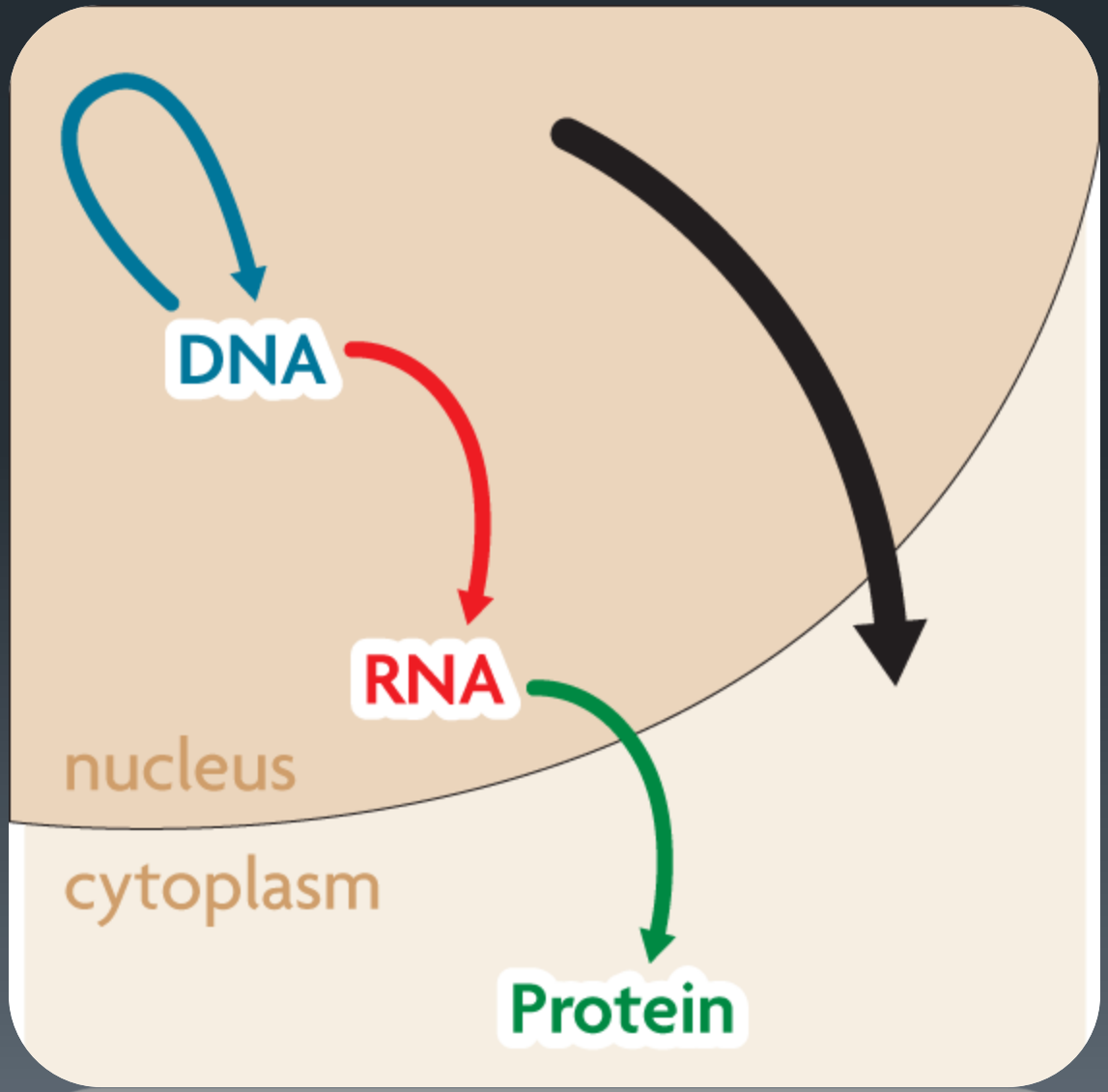
- **Enzymes** do the nitty-gritty jobs of every living cell.
- The importance of **DNA** is that it contains the information that is used to make all of the proteins on which life depends.
- DNA is the **blueprint**
- Proteins are **the product**

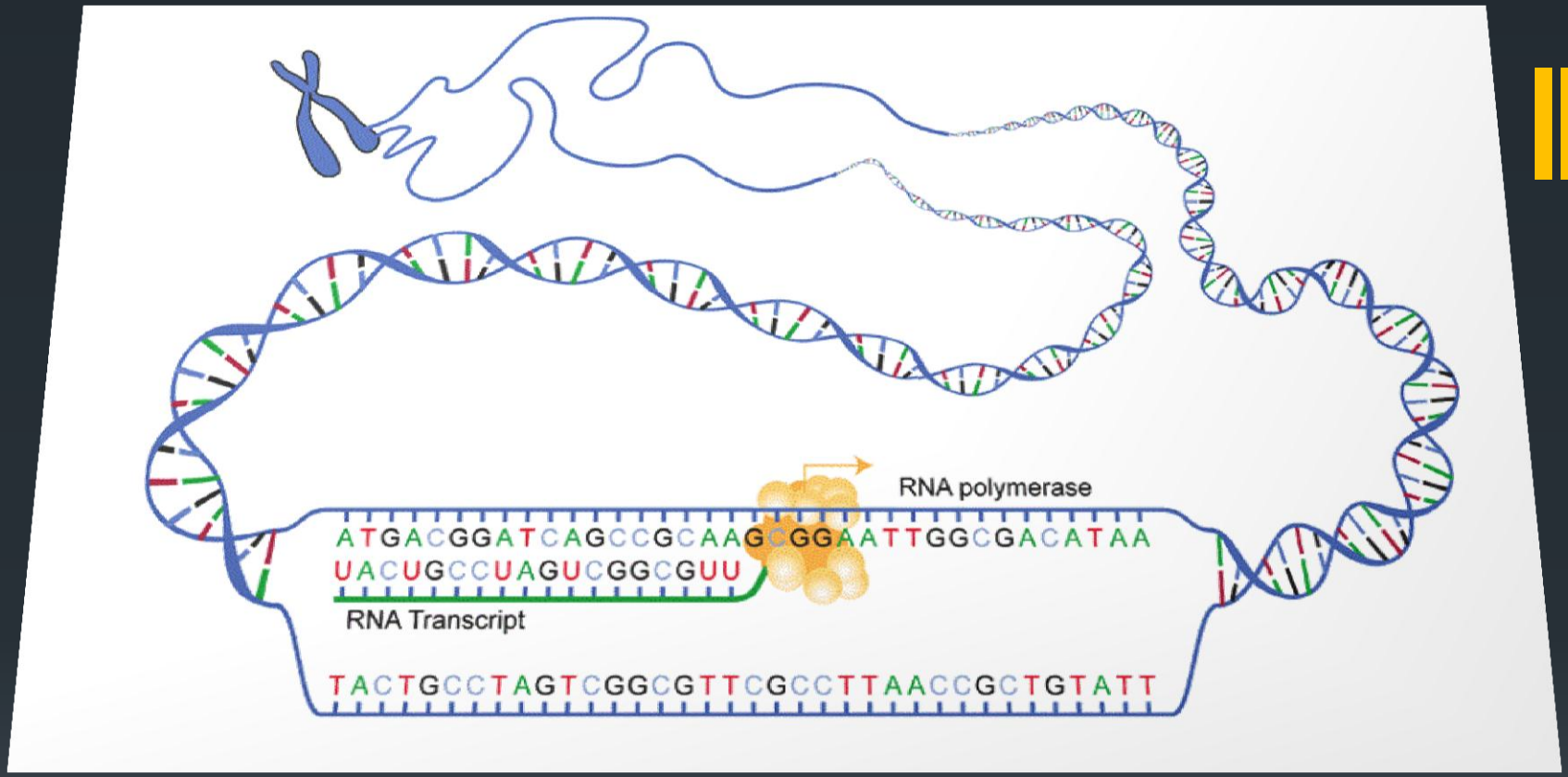
But how do we get from DNA to proteins? (2:53)



The Central Dogma

The central dogma states that information flows in **one direction** from **DNA to RNA to proteins**.





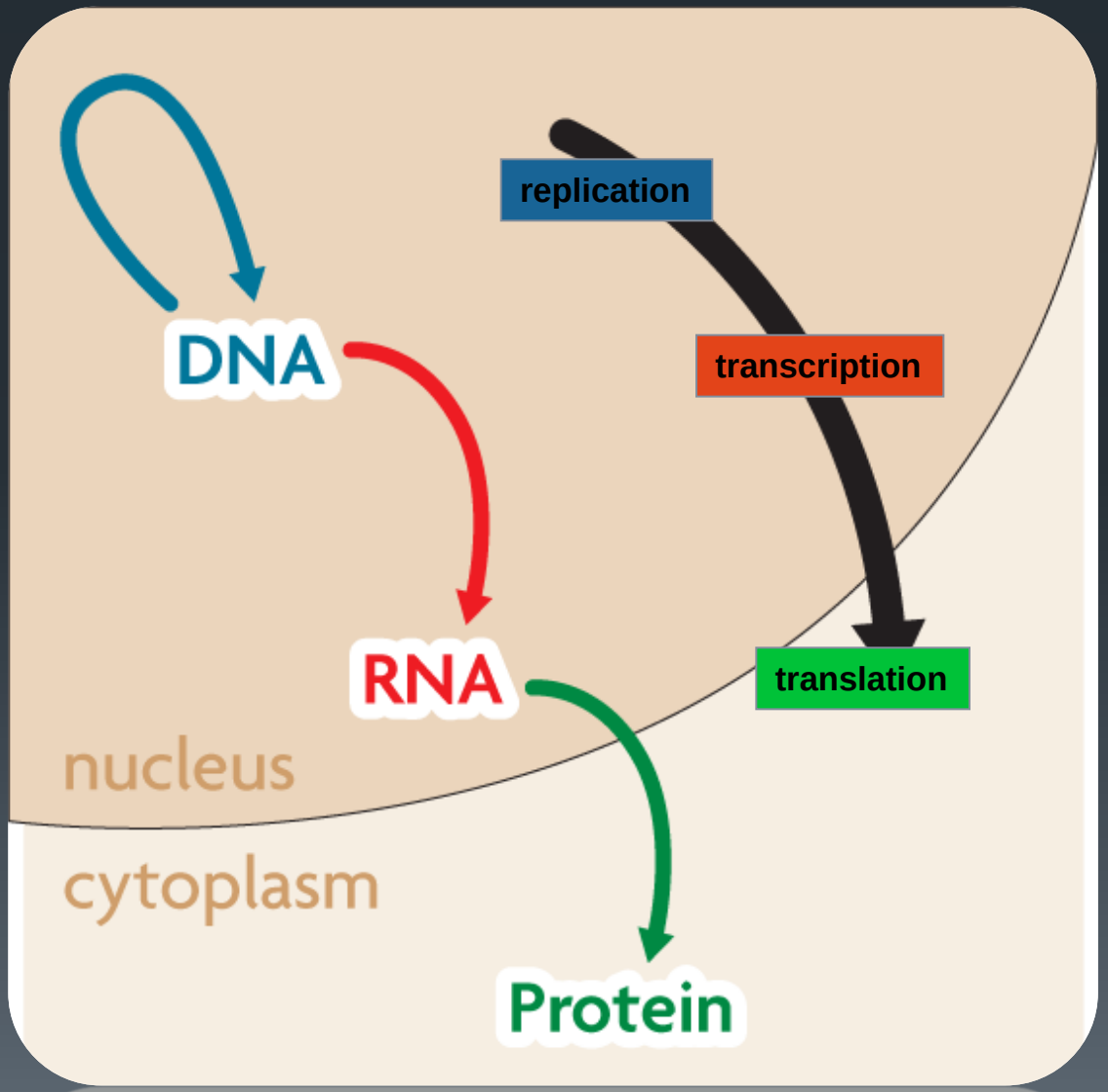
Transcription

Converting a gene from the DNA blueprint into a complementary single-stranded RNA sequence

The central dogma includes three processes:

– Replication
– Transcription
– Translation

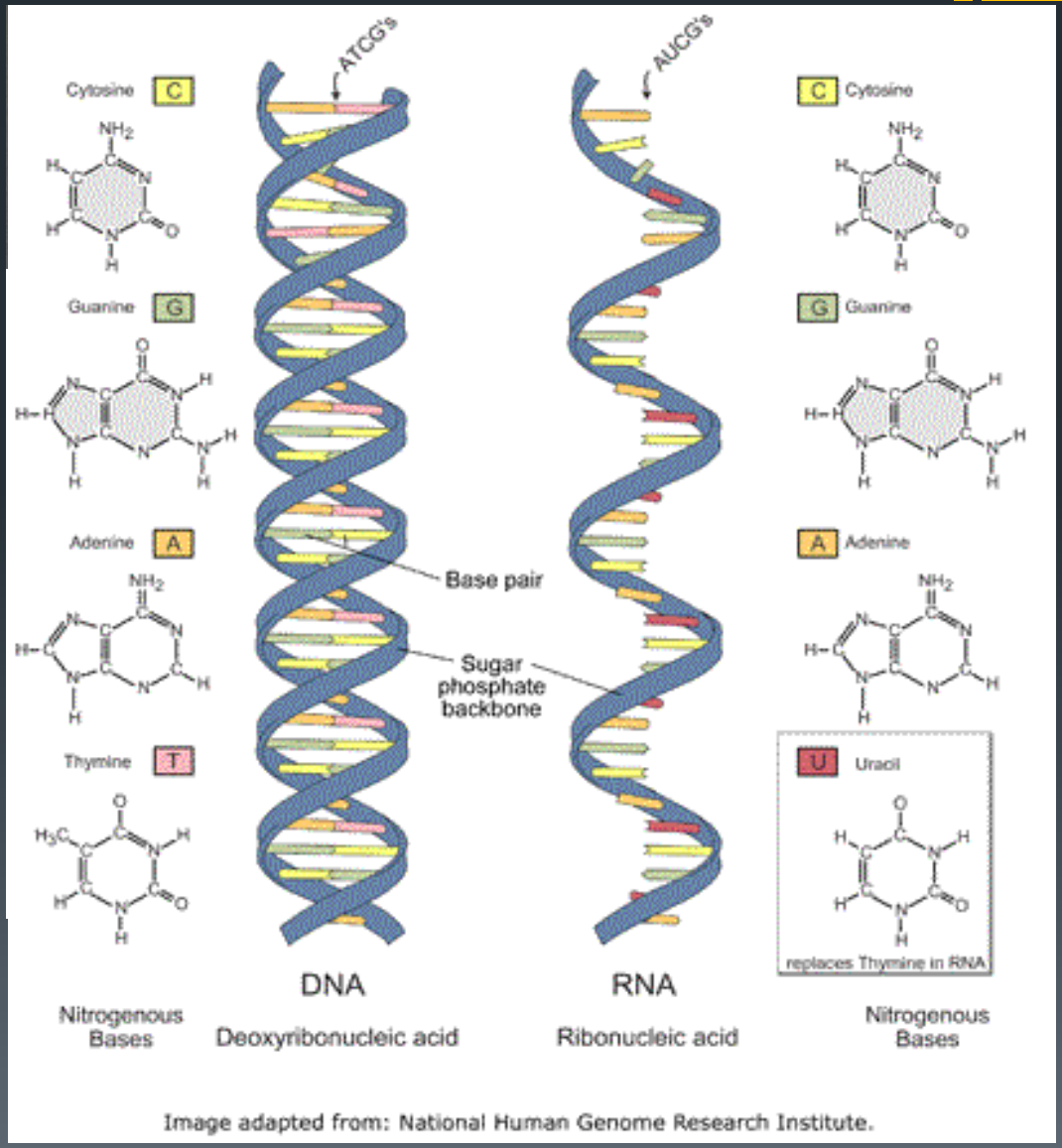
RNA is a link between DNA and proteins.



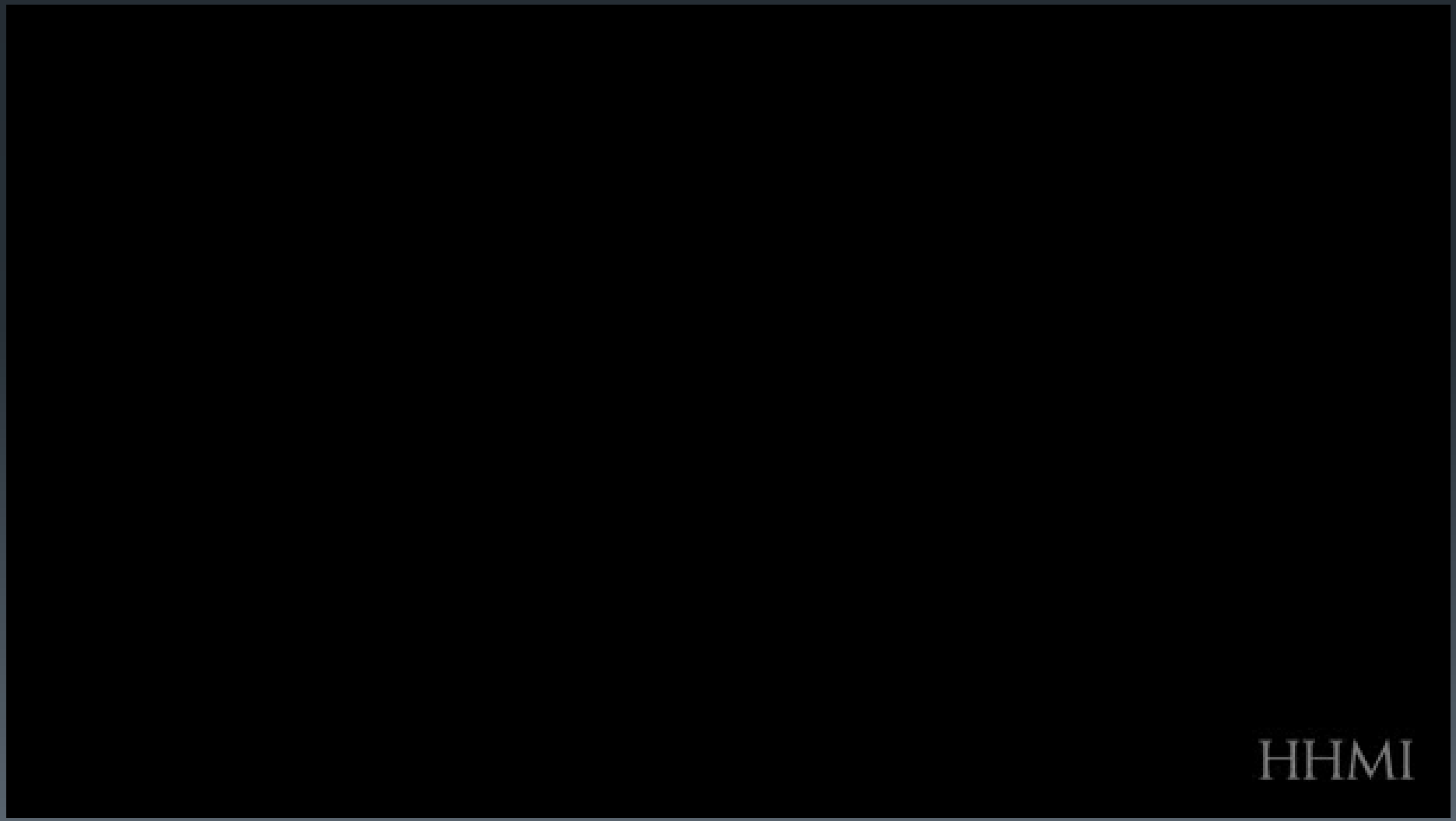
RNA is very similar to DNA

However, it differs in 3 major ways:

- RNA has a **ribose sugar.**
- RNA has **uracil** instead of thymine.
- RNA is a **single-stranded** structure.



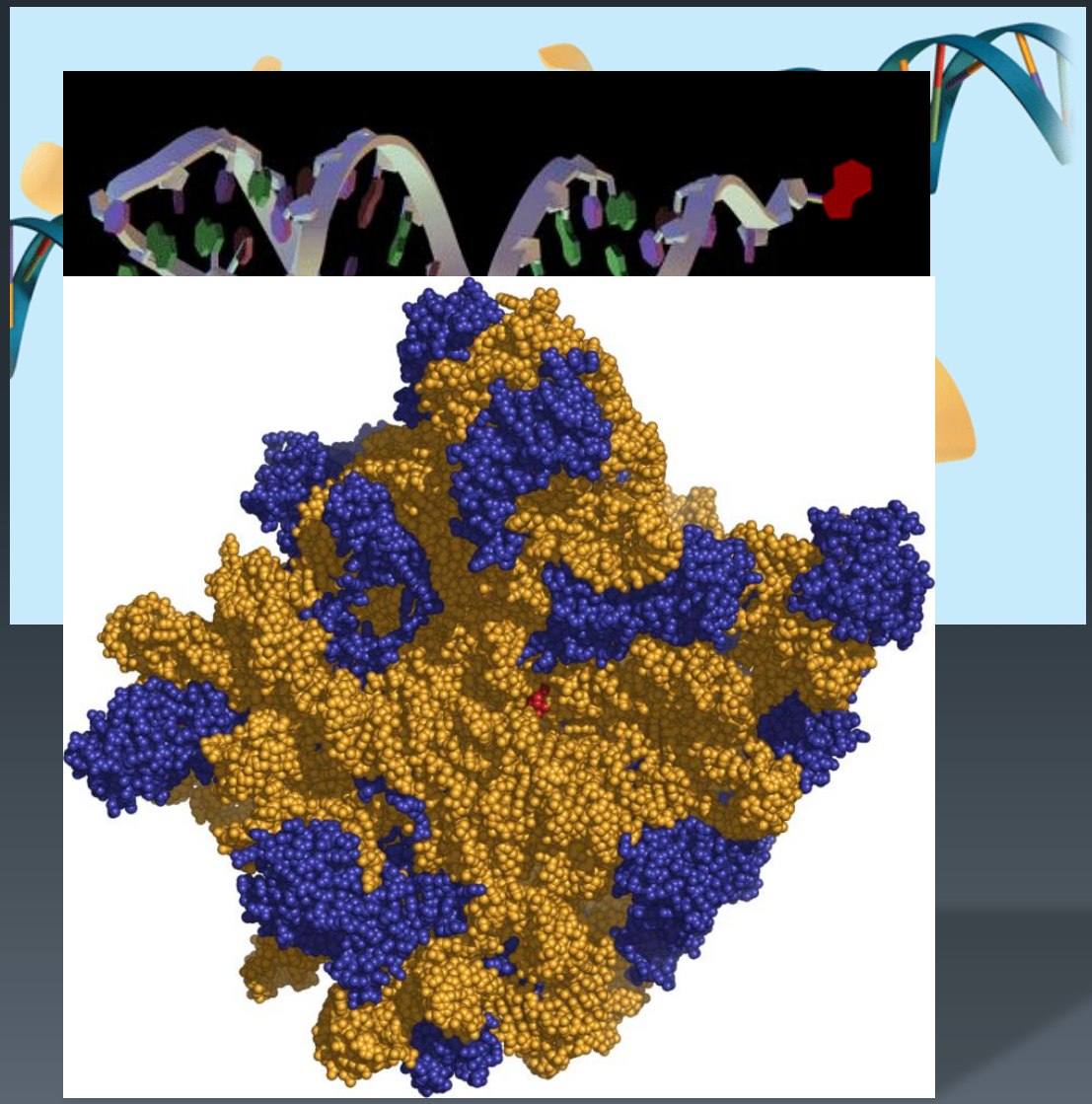
RNA may fold and take many shapes (0:30)



Protein Synthesis uses 3 types of RNA

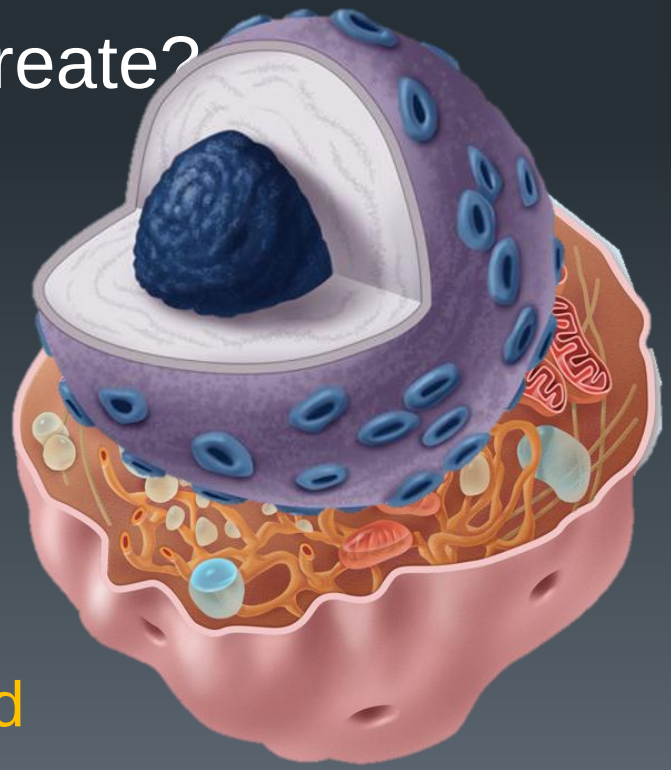
Three forms of RNA involved in protein synthesis

1. mRNA (messenger): **copies instructions from DNA** and carries these to the ribosome**.**
2. tRNA (transfer): **carries amino acids** from the cytoplasm to the ribosome.
3. rRNA (ribosomal): composes parts of the ribosome, which **is the site of protein synthesis**



Transcription Occurs in the Nucleus

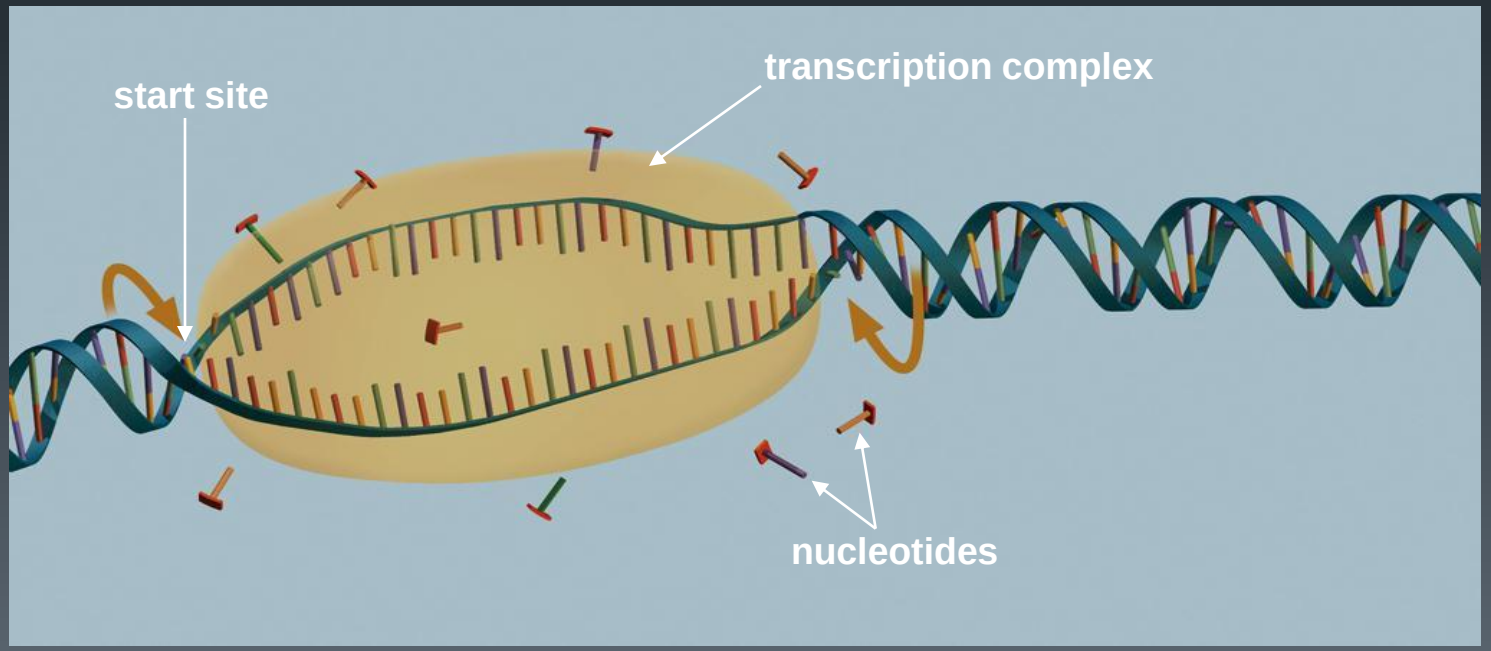
- Transcription copies DNA to make a **complementary strand of RNA**
- This takes place **inside the nucleus**
- What advantage(s) might this create?



DNA is more protected from splicing and mutagens. Also, it is better regulated

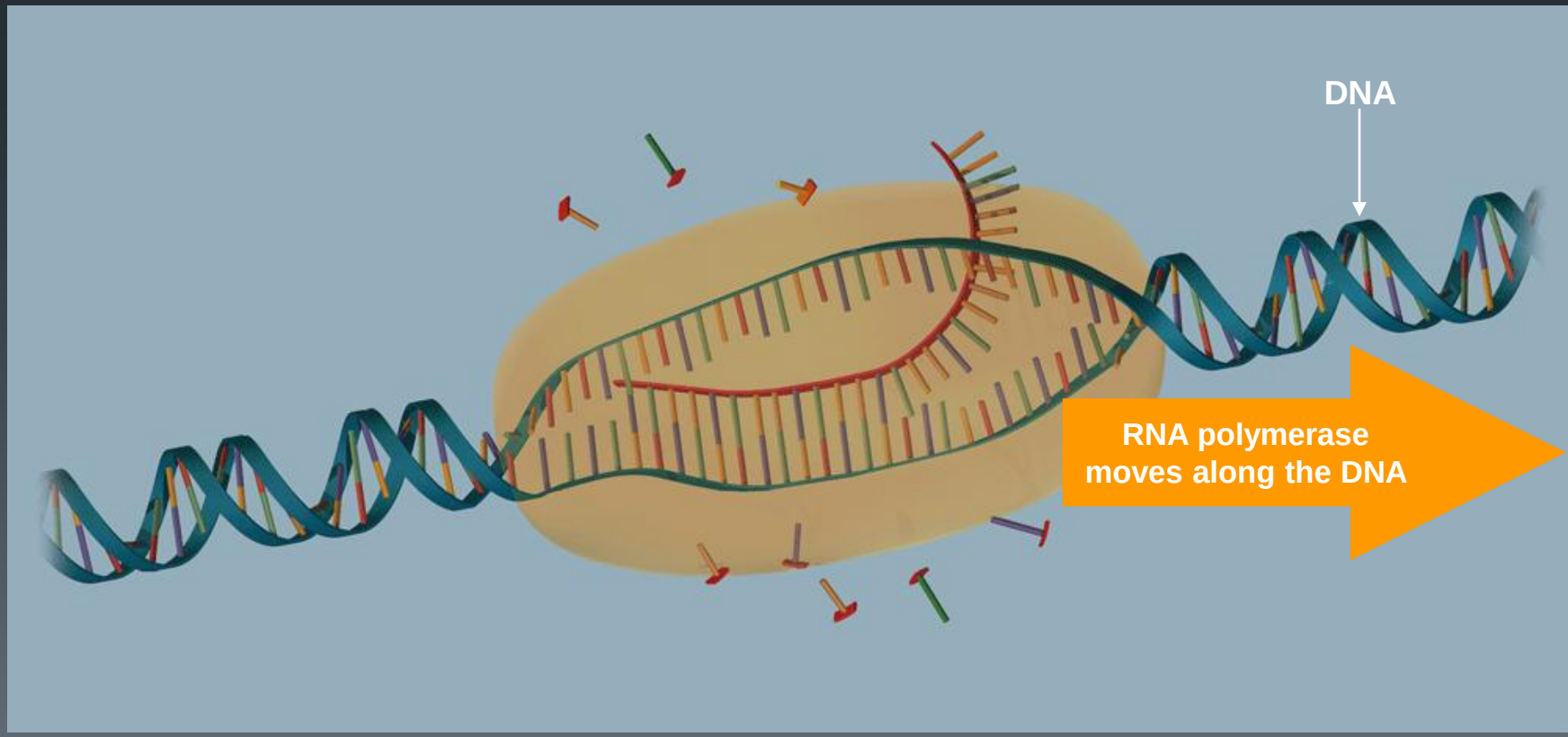
How Transcription Occurs

1. **RNA polymerase** untwists and unzips a section of the DNA (usually a single gene).



2. RNA polymerase **pairs free RNA nucleotides** to the exposed bases of one of the DNA strands following **base pair rules**, except **Uracil replaces** thymine

3. The DNA helix winds again as the gene is transcribed.



4. The RNA strand **detaches from** the DNA once the gene is transcribed.
5. The mRNA strand, with instructions for building a protein, **leaves the nucleus and enters the cytoplasm**

TRANSCRIPTION EXAMPLE

- Transcribe the following DNA Sequence into mRNA

Template DNA:

TAC CGG ATG CTA GGA TCA

AUG GCC UAC GAU CCU AGU

How is DNA replication **similar** to transcription?

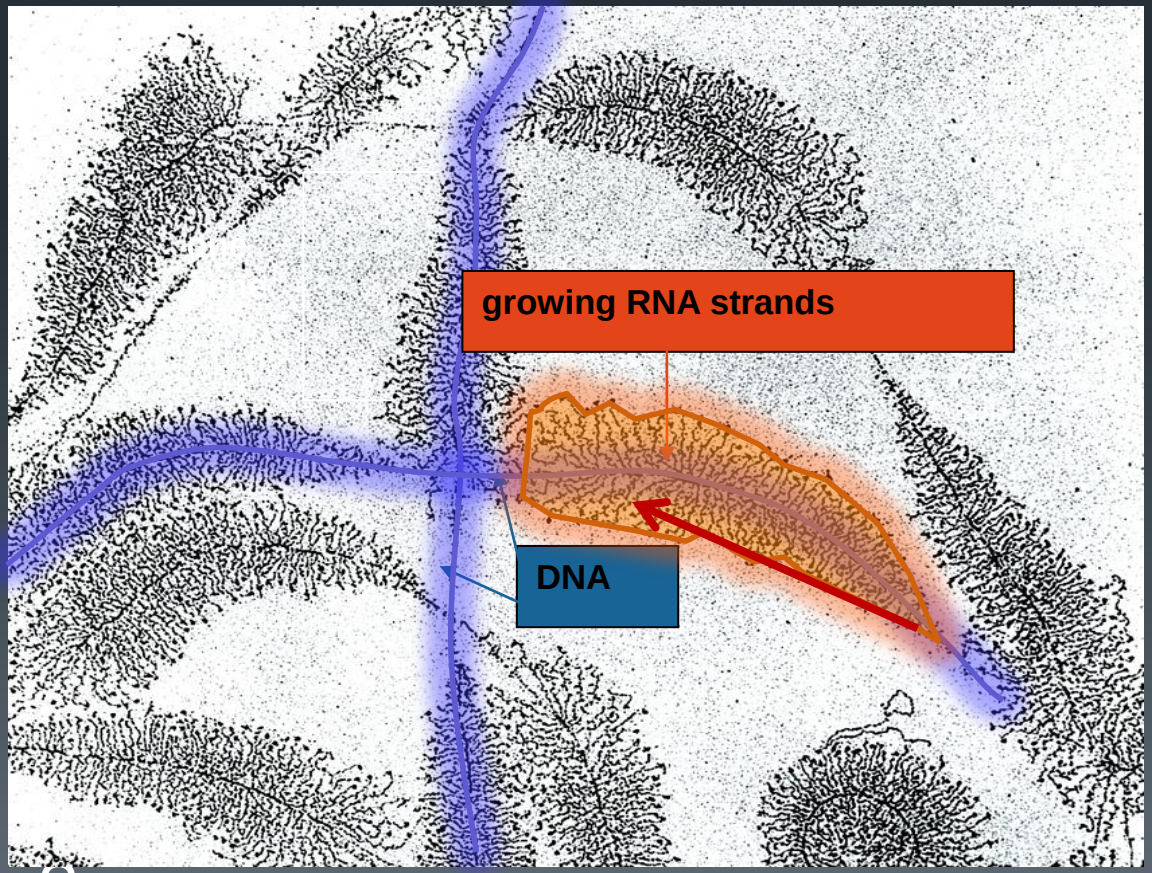
How are the two processes **different**?

The transcription process is similar to replication

Transcription and replication both involve complex enzymes and complementary base pairing

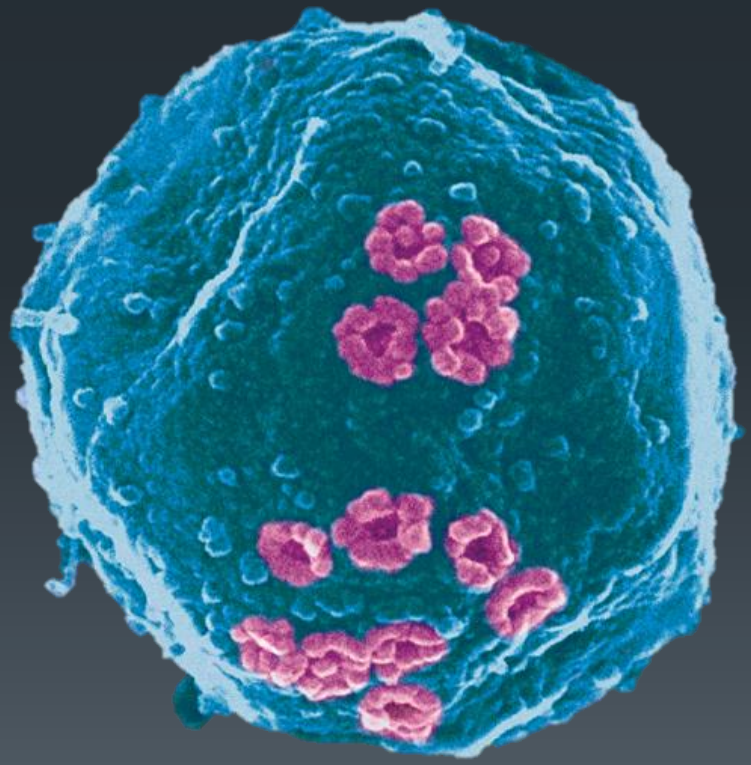
The two processes have **different end results**.

- Replication copies the entire DNA; **transcription copies a gene**.
- Replication makes one copy; **transcription can make many copies**.

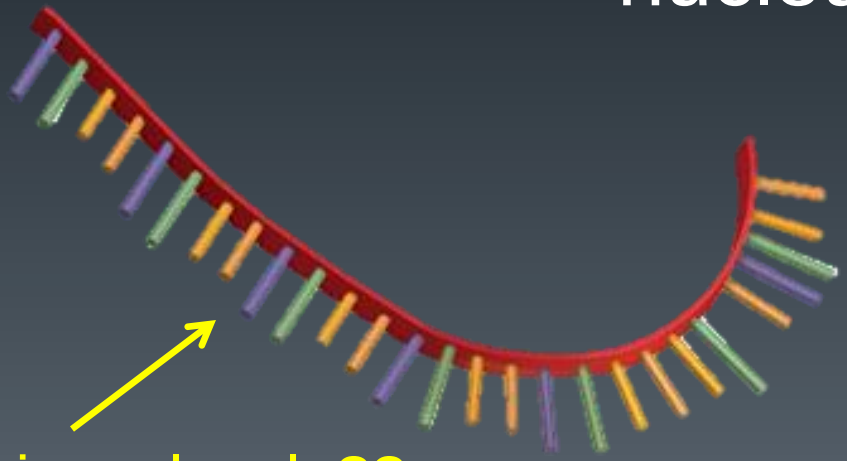


- Which direction is transcription occurring?

Result of Transcription



Completed mRNA template leaves the nucleus



What do you notice about this molecule??
(compared to DNA)