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 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)