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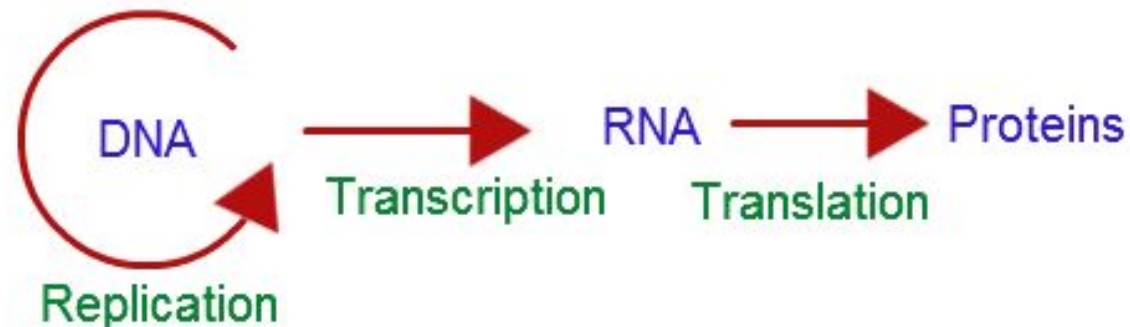
# Central Dogma of life

Transcription and Translation

# Central Dogma of life

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- The information content of DNA is in the form of specific sequences of nucleotides
- The DNA inherited by an organism leads to specific traits by dictating the synthesis of proteins
- **Gene expression**, the process by which DNA directs protein synthesis, includes two stages: transcription and translation
- Genes specify proteins via transcription and translation
- The central dogma of biology describes the flow of information from gene sequence to protein product



# An Analogy

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- When you get to the library, you search through the shelves until you find a book that has a good set of instructions for making a table.
- The library doesn't have a photocopier, but you came well-prepared and you whip out your pen and notebook and copy down (or 'transcribe') the instructions.
- Satisfied, you take your notes and head back home.
- At home, you have all the wood and tools to make the table.
- You follow the instructions and make the table, effectively 'translating' the written words into a table which you can use in your room.

# An Analogy

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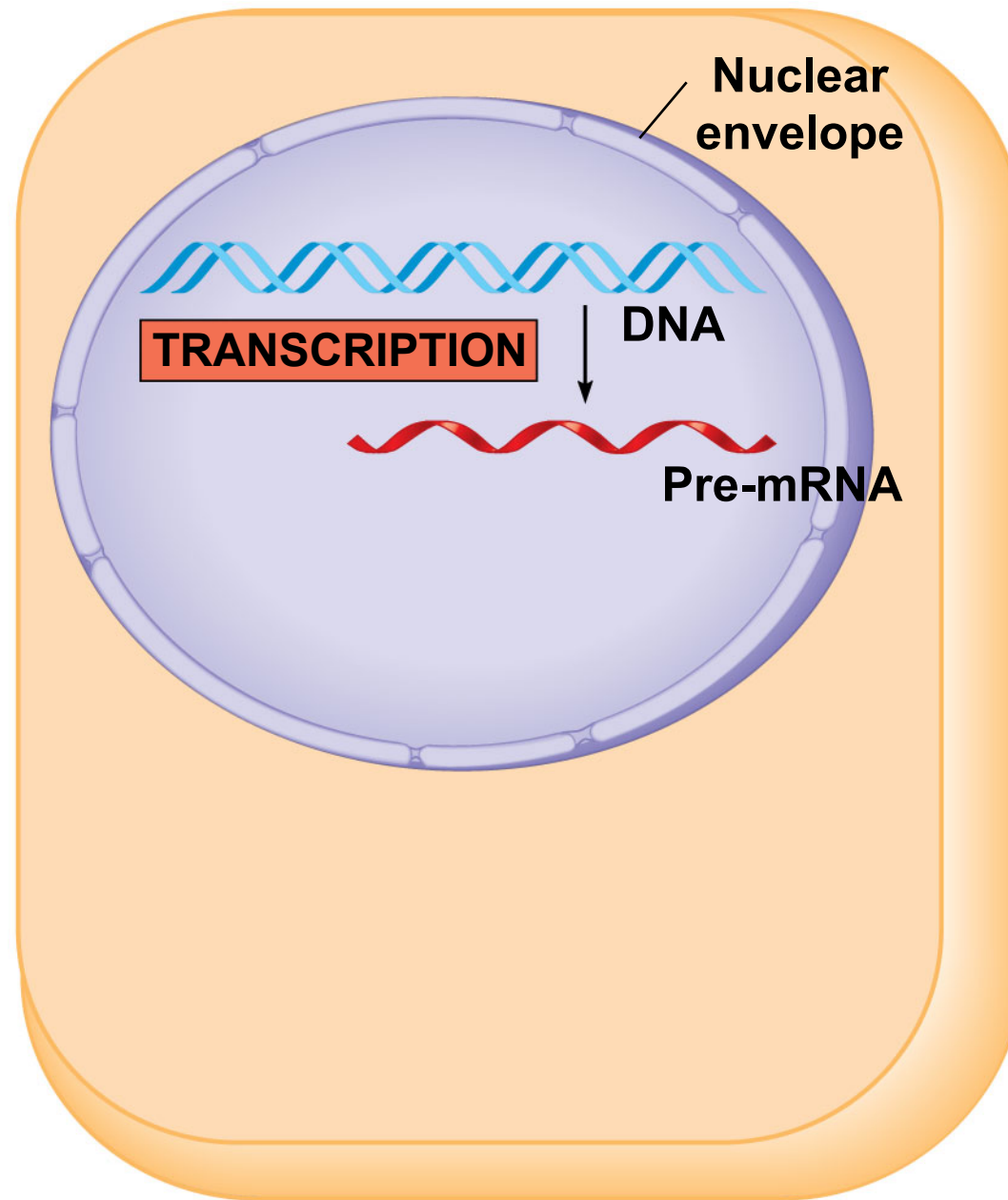
- Library = Nucleus
- Books in the library = DNA in the form of chromosome
- One chapter = One gene ( contains instruction for one type of protein)
- Notebook = Represents RNA, which is a smaller molecule that can move out of the nucleus into the cytoplasm, where proteins are made
- Home = Cytoplasm
- Table = One protein product
- Wood to make the table = amino acids for building proteins

# Basic Principles of Transcription and Translation

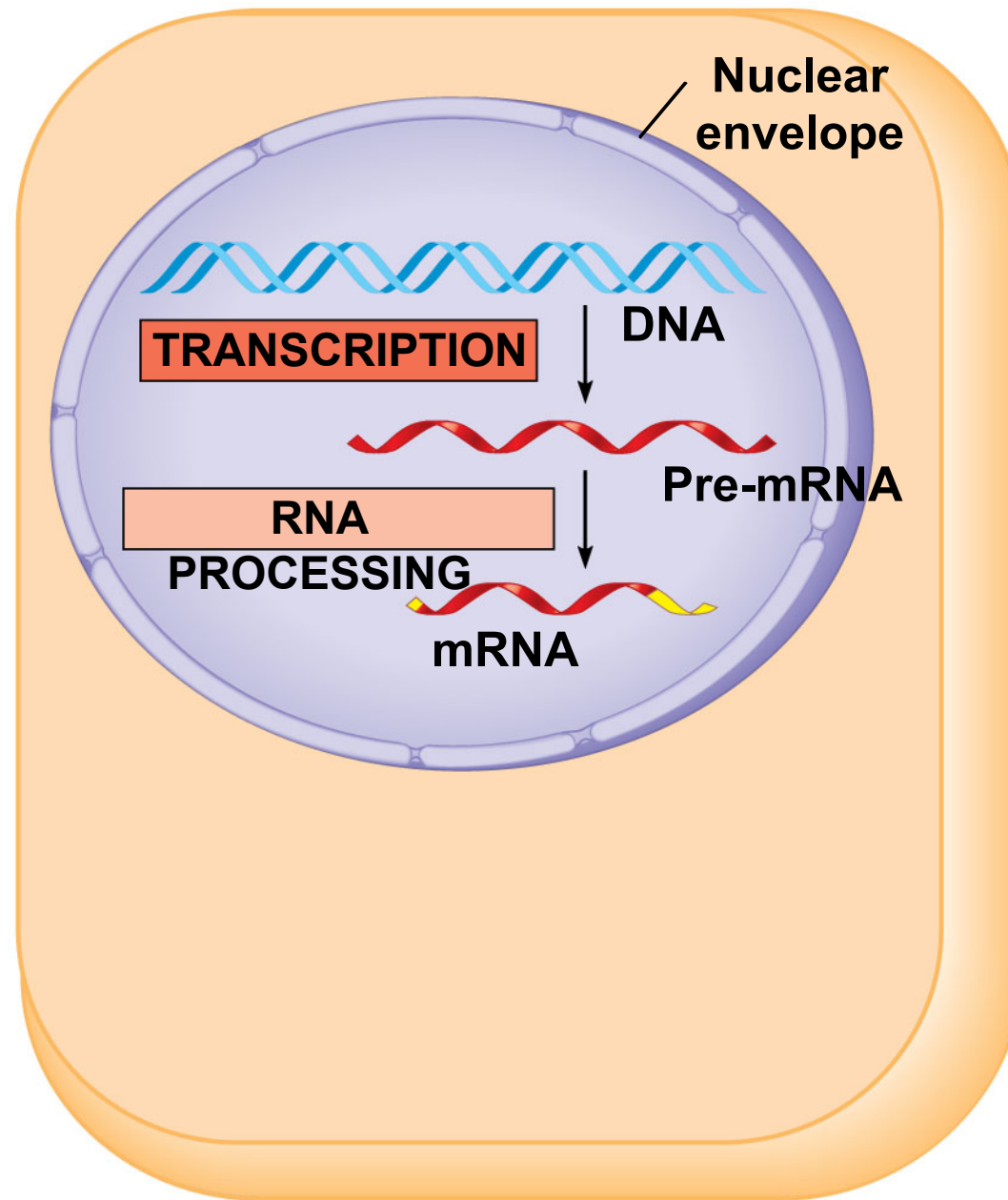
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- RNA is the bridge between genes and the proteins for which they code
- **Transcription** is the synthesis of RNA using information in DNA
  - Transcription produces **messenger RNA (mRNA)**
- **Translation** is the synthesis of a polypeptide, using information in the mRNA
  - **Ribosomes** are the sites of translation

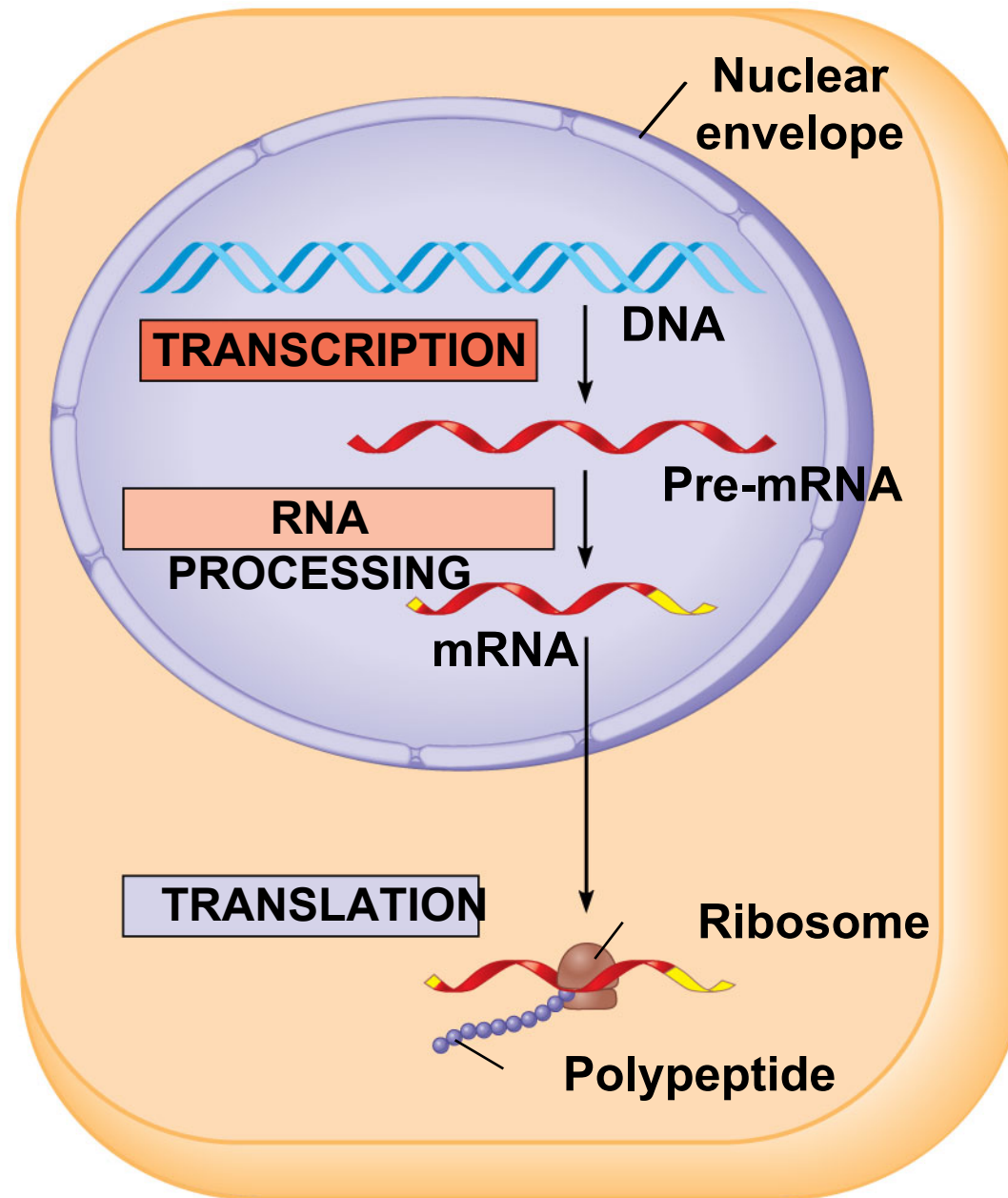




**(b) Eukaryotic cell**



**(b) Eukaryotic cell**



**(b) Eukaryotic cell**



# Transcription

- DNA sequence information is converted to mRNA in a process called transcription

Steps:

1. The double-stranded DNA molecule is partially unzipped
2. An enzyme called RNA polymerase copies the gene's nucleotides one by one into an mRNA molecule.

Like DNA, mRNA is made of a particular sequence of nucleotides

Unlike DNA, mRNA has only a single strand, and the base Thymine in DNA is replaced by Uracil in RNA

Very importantly, mRNA is small and can easily exit the nucleus and go to the cytoplasm, where proteins are made.

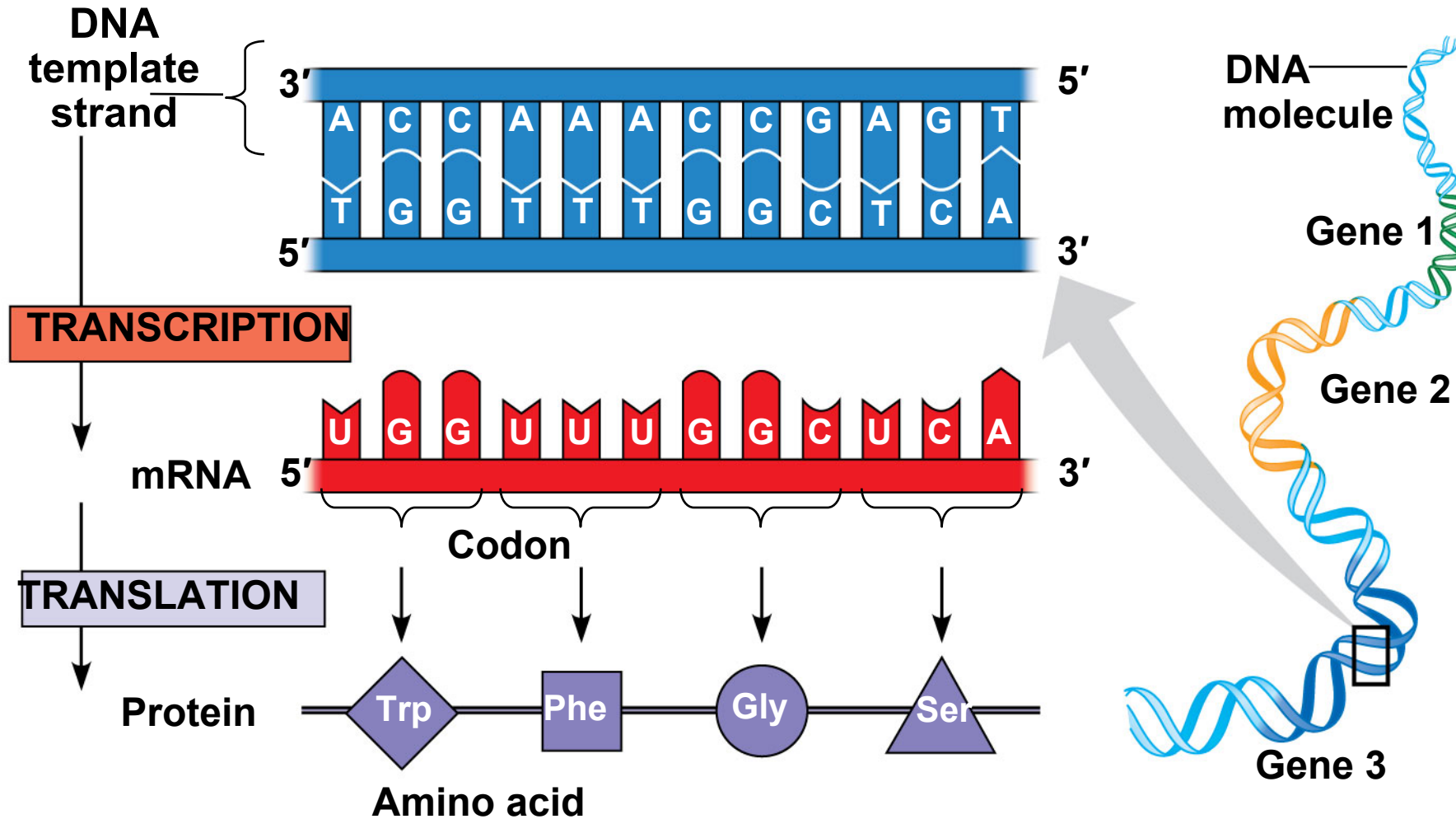


# Translation

- The sequence encoded in the mRNA molecule is decoded and converted to an amino acid sequence in a process called **translation**.

Steps:

1. After a mature mRNA leaves the nucleus of a cell, it heads for a ribosome in the cell's cytoplasm where the code it contains can be translated to produce a protein
2. As the strand of mRNA slides through the ribosome, the code is read three nucleotides at a time (called a codon).
3. Each codon specifies one amino acid in the polypeptide chain of a protein which are linked together to form a protein.



[https://www.youtube.com/watch?v=gG7uCskUOr  
A](https://www.youtube.com/watch?v=gG7uCskUOrA)

# Comparison between translation and transcription

	Transcription	Translation
Purpose	To make RNA copies of individual genes	To synthesize proteins which are used for cellular functions
Definition	Transcription is the synthesis of RNA from a DNA template.	Translation is the synthesis of a protein from an mRNA template. i.e., translating the DNA genetic information carried by mRNA to synthesize proteins. This is the second step of gene expression.
Products	mRNA	Proteins
Location	Nucleus	Cytoplasm