PROTEIN SYNTHESIS

The Protein-making Process

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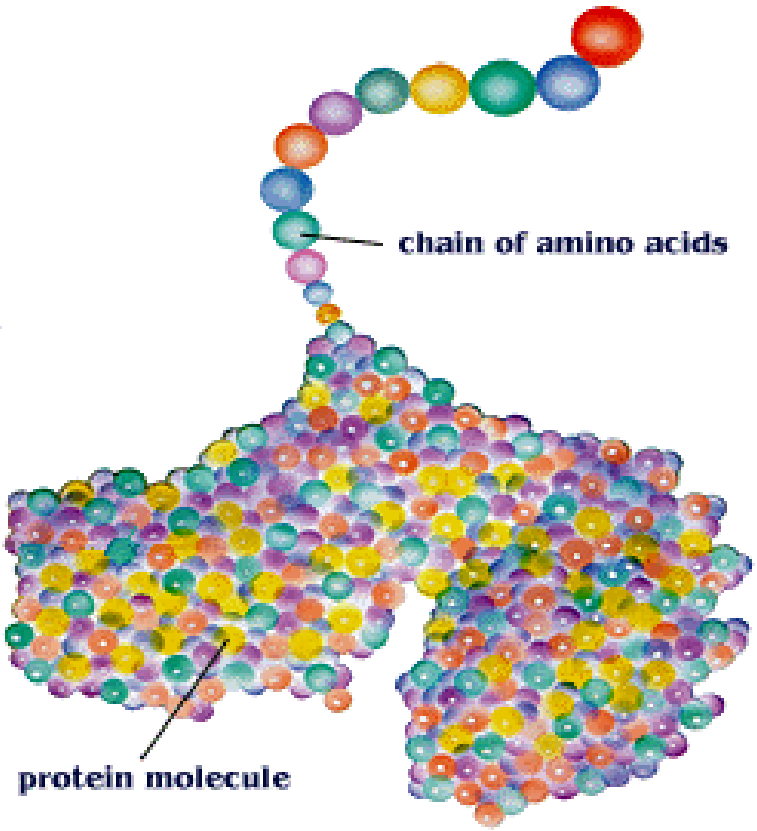
Protein Synthesis (Gene Expression) Notes

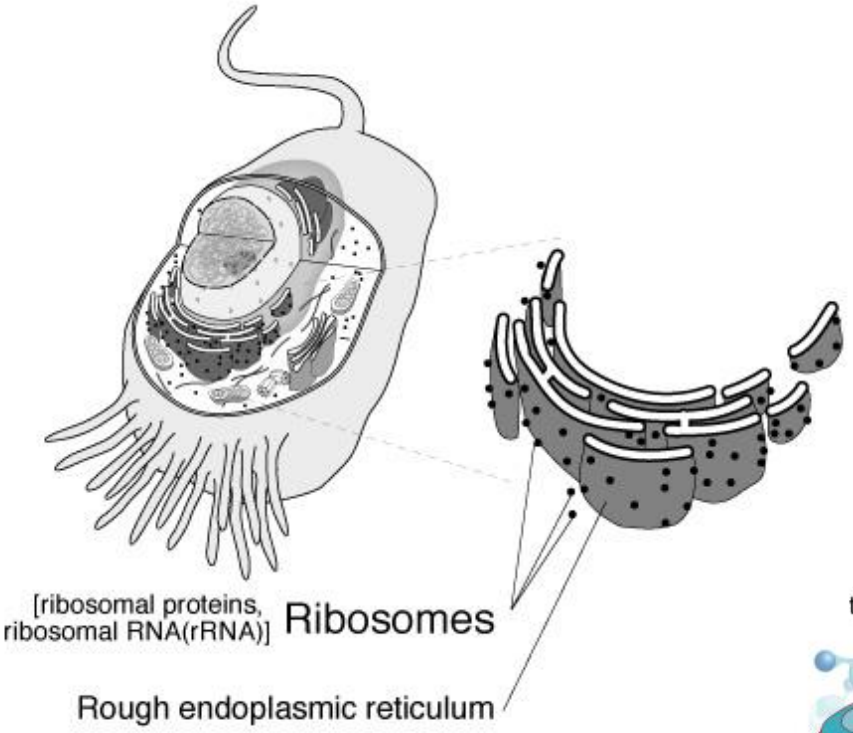
Proteins (Review)

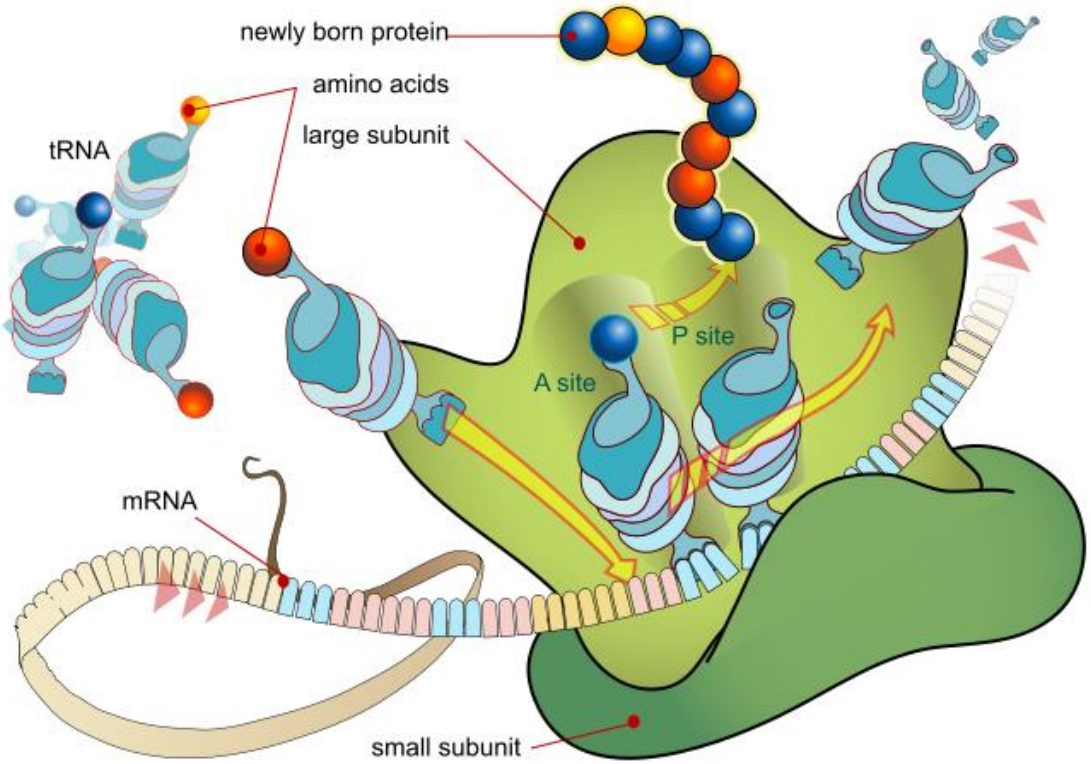
- Proteins make up all **living** materials

- Proteins are composed of **amino acids** – there are **20** different amino acids
- Different **proteins** are made by **combining** these 20 amino acids in different combinations



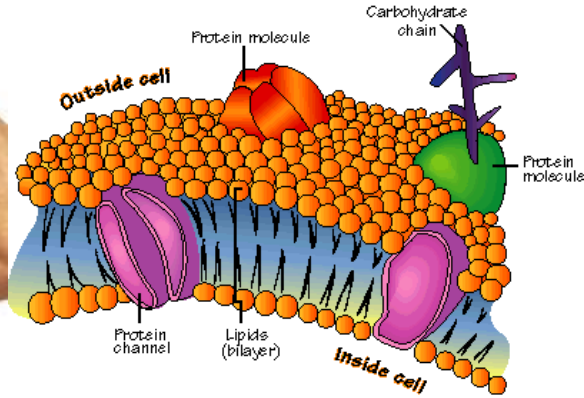
- Proteins are manufactured (made) by the **ribosomes**





- Function of proteins:
  1. Help fight **disease**
  2. Build new body **tissue**
  3. **Enzymes** used for digestion and other chemical reactions are proteins

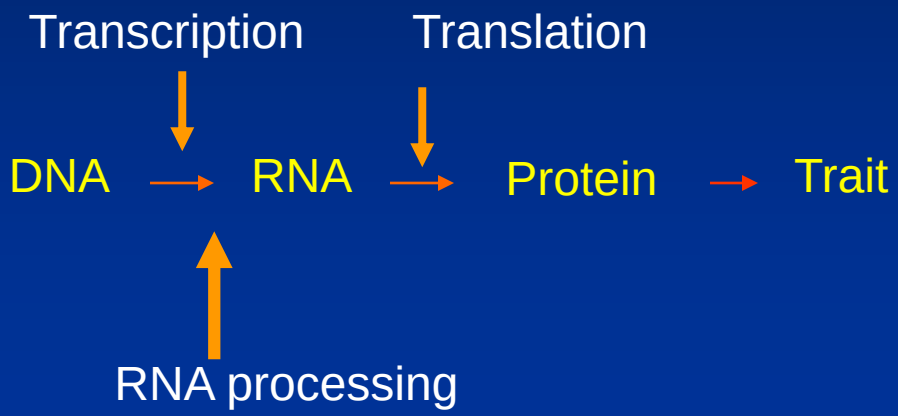
     (Enzymes **speed up** the **rate** of a reaction)
  4. Component of all **cell membranes**

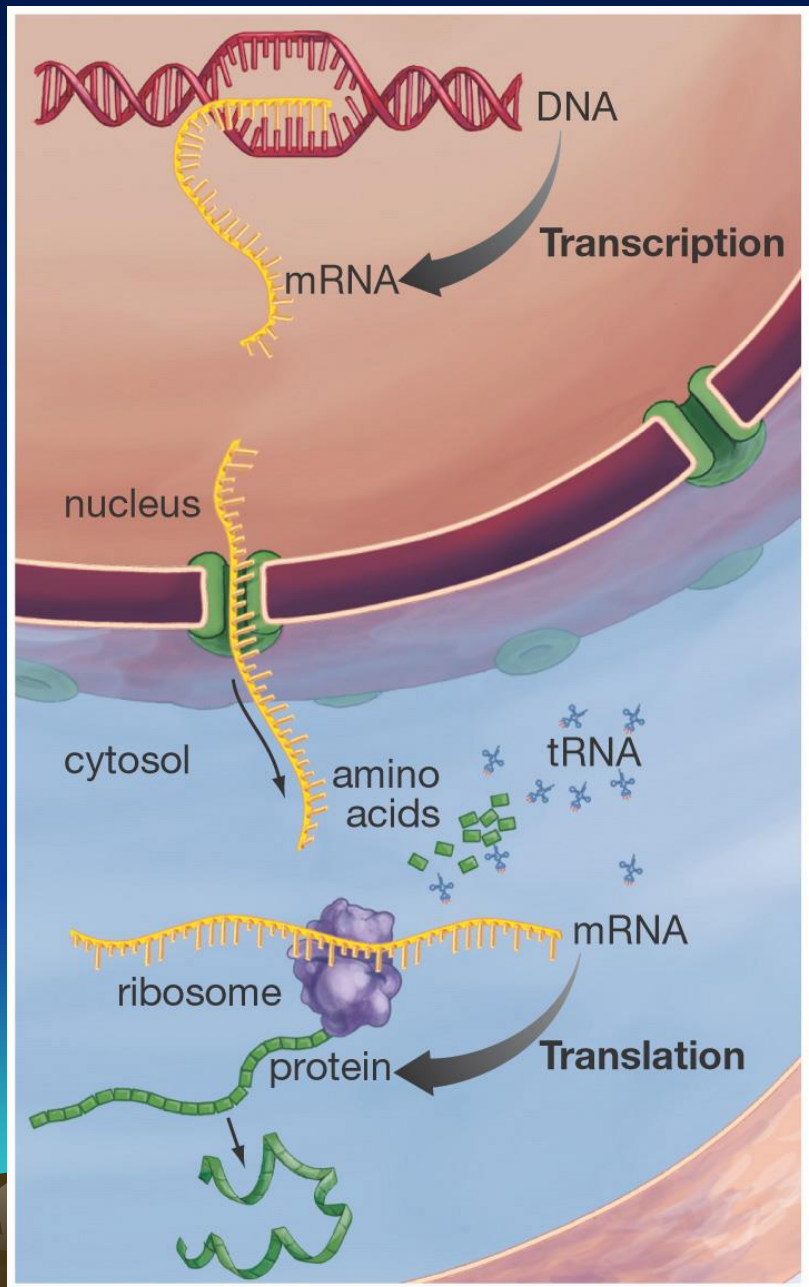


MAKING PROTEINS

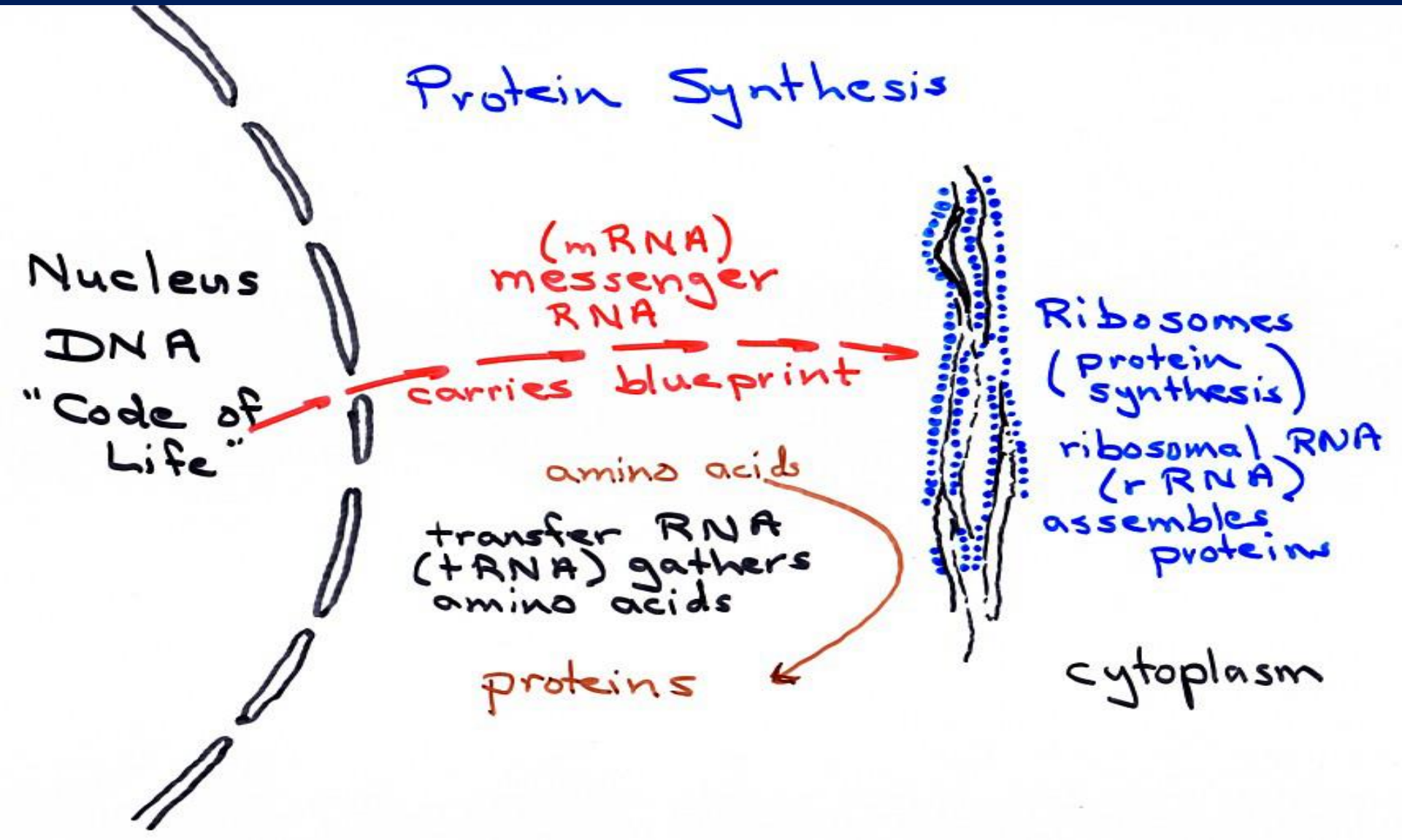
Step 1: Transcription

The “Central Dogma” of Molecular Genetics





Protein synthesis

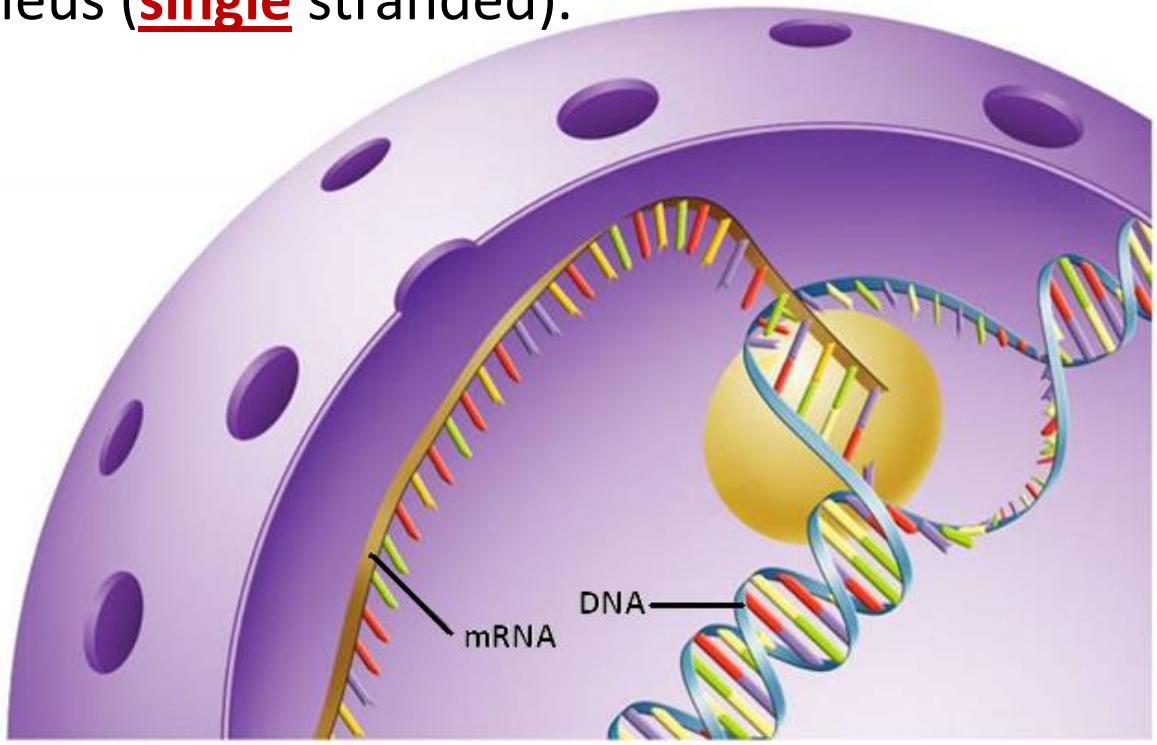


Making a Protein—Transcription

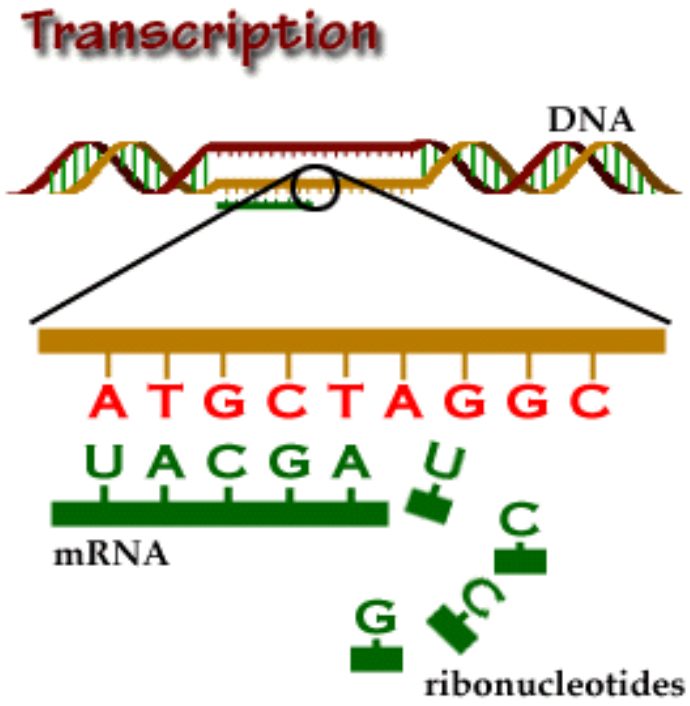
- **First Step**: **Copying** of genetic information from **DNA** to **RNA** called **Transcription**

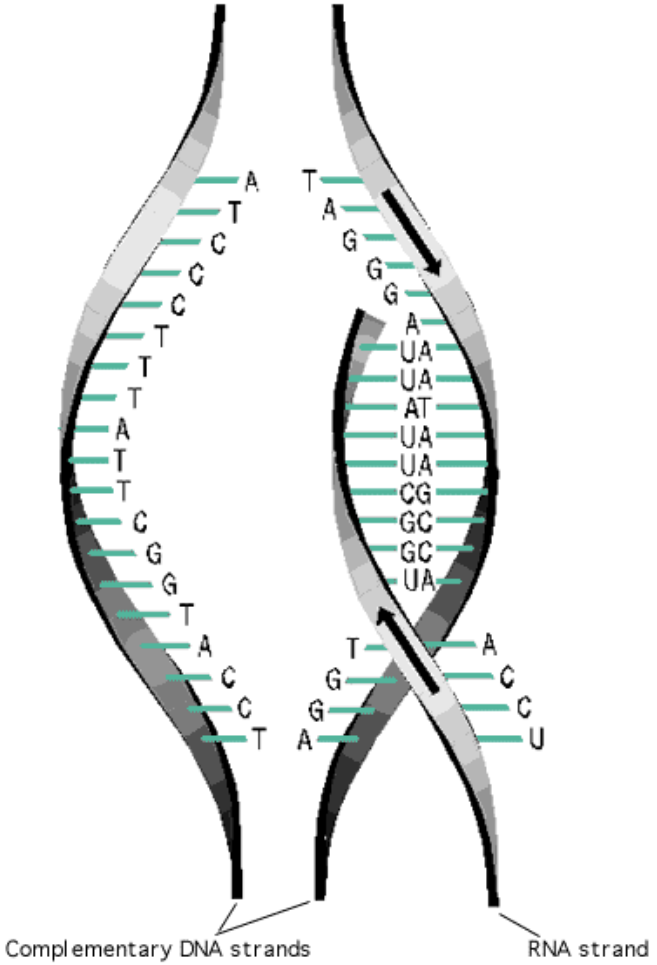
  Why? DNA has the **genetic code** for the **protein** that needs to be made, but proteins are made by the ribosomes—ribosomes are outside the **nucleus** in the **cytoplasm**.

  DNA is too **large** to leave the nucleus (**double** stranded), but RNA **can leave** the nucleus (**single** stranded).

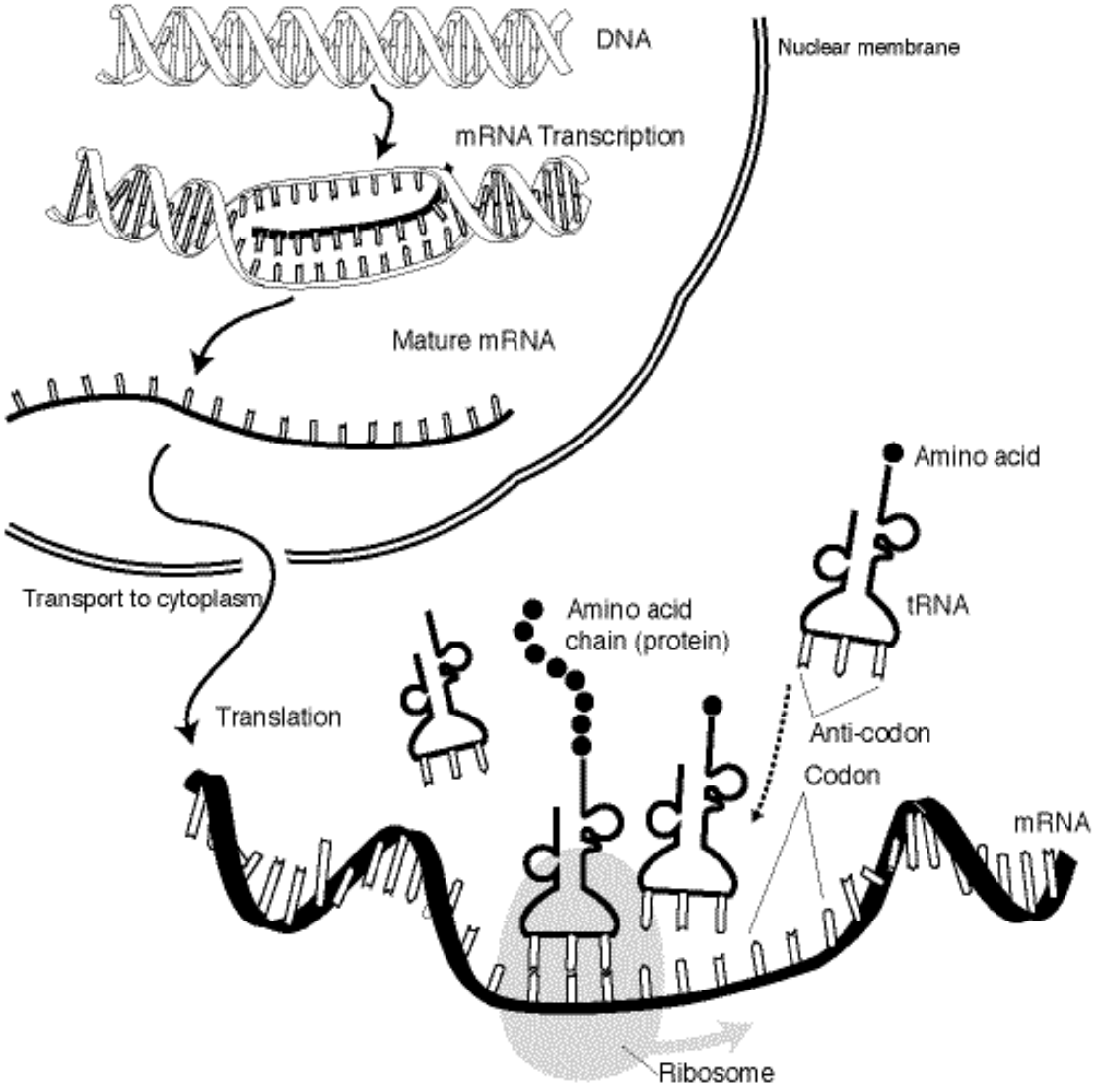


- Part of DNA temporarily **unzips** and is used as a **template** to assemble **complementary** nucleotides into **messenger RNA** (mRNA).





- mRNA then goes through the **pores** of the nucleus with the DNA **code** and attaches to the **ribosome**.

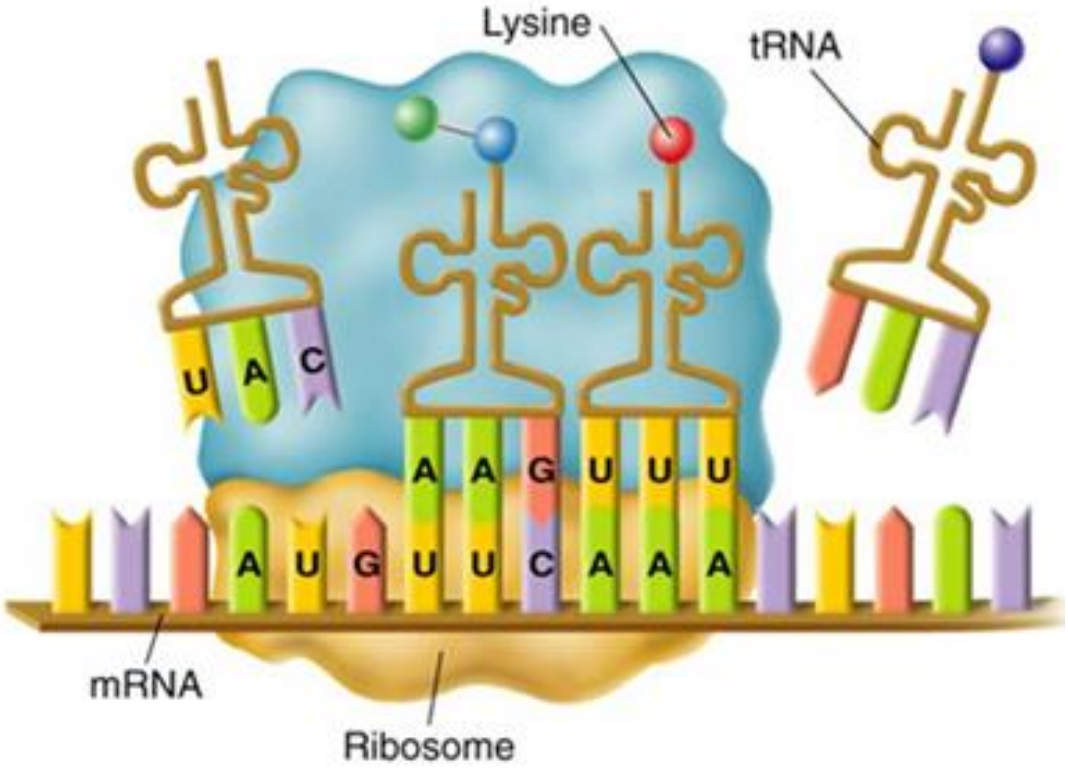


MAKING PROTEINS

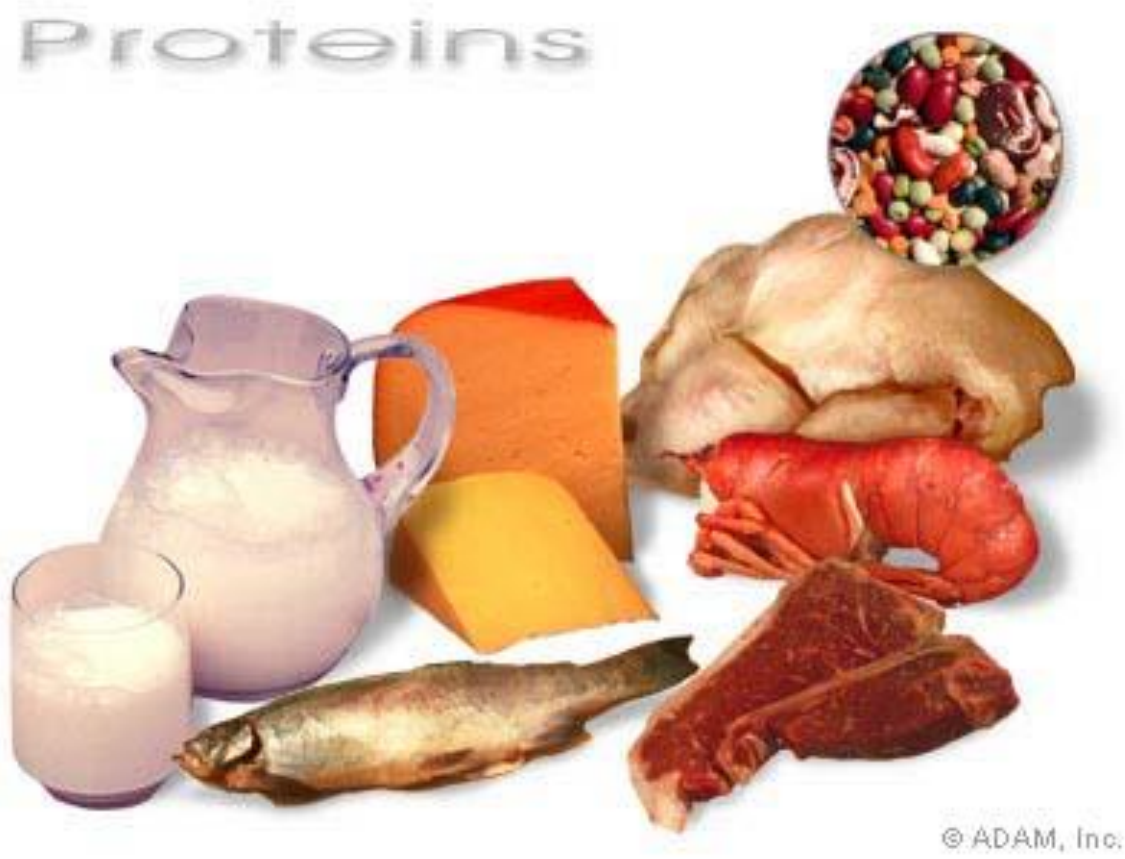
Step 2: Translation

Making a Protein—Translation

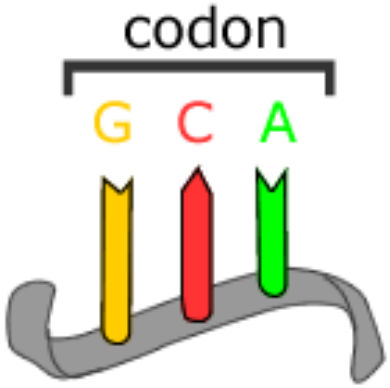
- **Second Step**: **Decoding** of mRNA into a **protein** is called **Translation**.
- **Transfer RNA** (tRNA) carries **amino acids** from the cytoplasm to the **ribosome**.



These amino acids come from the **food we eat**. Proteins we eat are broken down into individual **amino acids** and then simply **rearranged** into new **proteins** according to the needs and directions of our **DNA**.

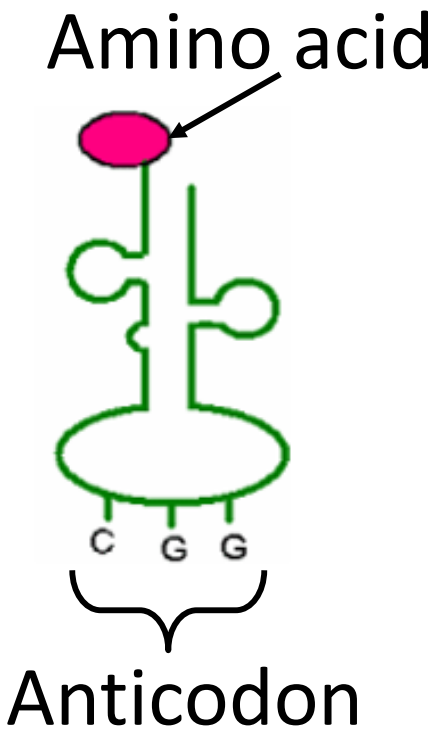


- A series of **three** adjacent **bases** in an mRNA molecule codes for a specific amino acid—called a **codon**.

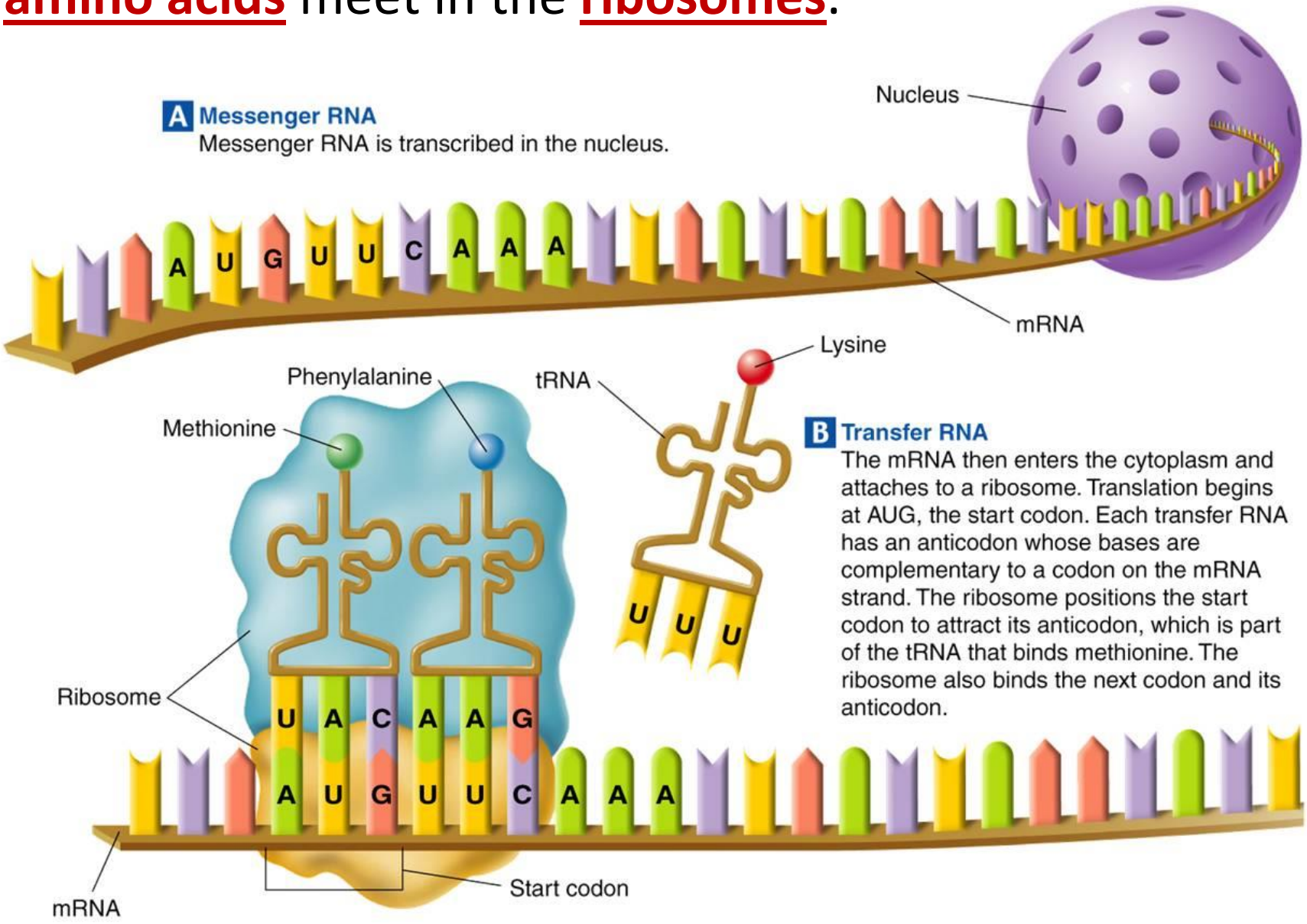


- Each **tRNA** has 3 nucleotides that are **complementary** to the **codon** in mRNA.

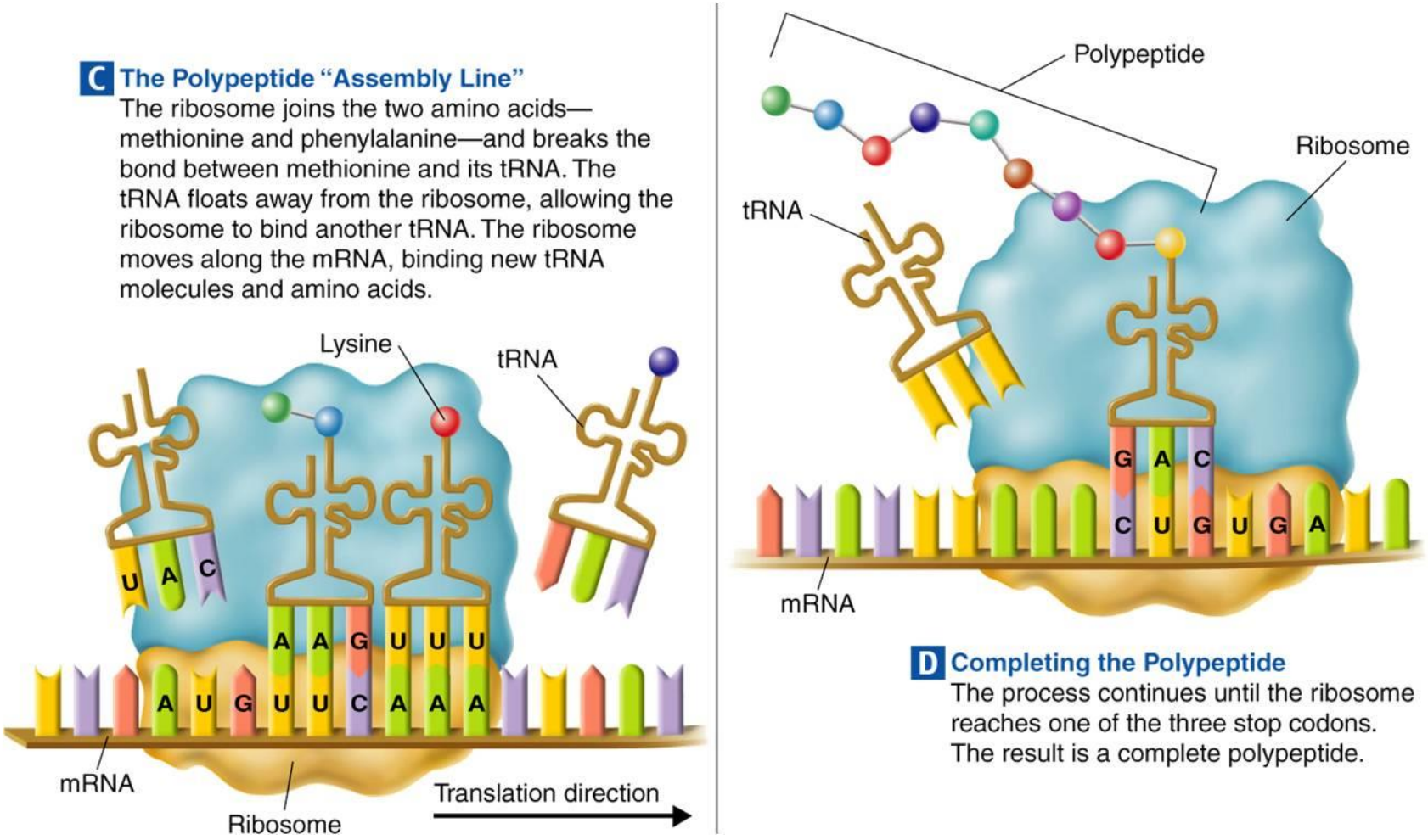
- Each **tRNA** codes for a **different** amino acid.



- mRNA carrying the **DNA instructions** and tRNA carrying **amino acids** meet in the **ribosomes**.



- Amino acids are joined together to make a **protein**.



Polypeptide = **Protein**

Use one of the codon charts on the next page to find the amino acid sequence coded for by the following mRNA strands.

CAC/CCA/UGG/UGA

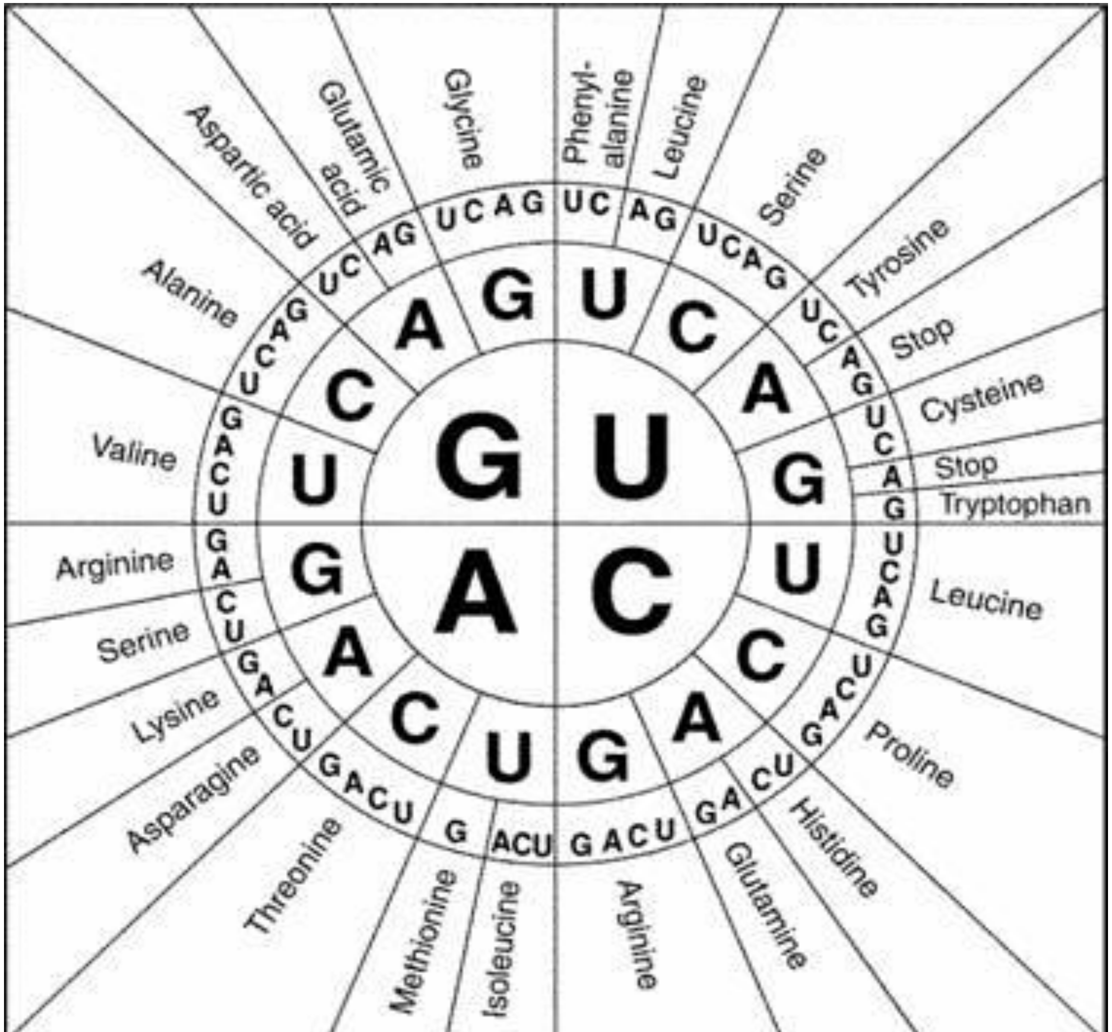
_____/_____/_____/_____

AUG/AAC/GAC/UAA

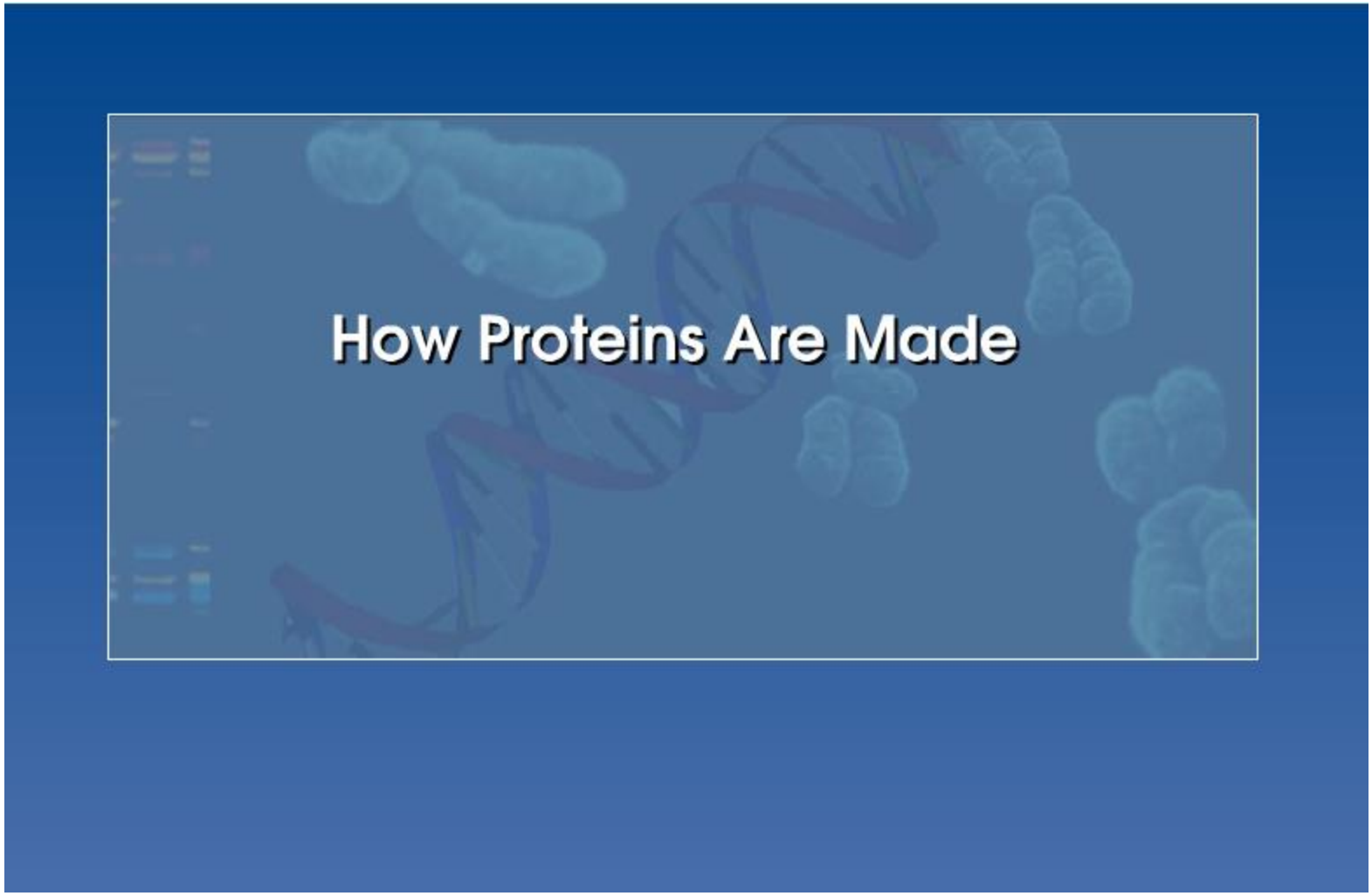
_____/_____/_____/_____

AUG/AAC/GAC/UAA

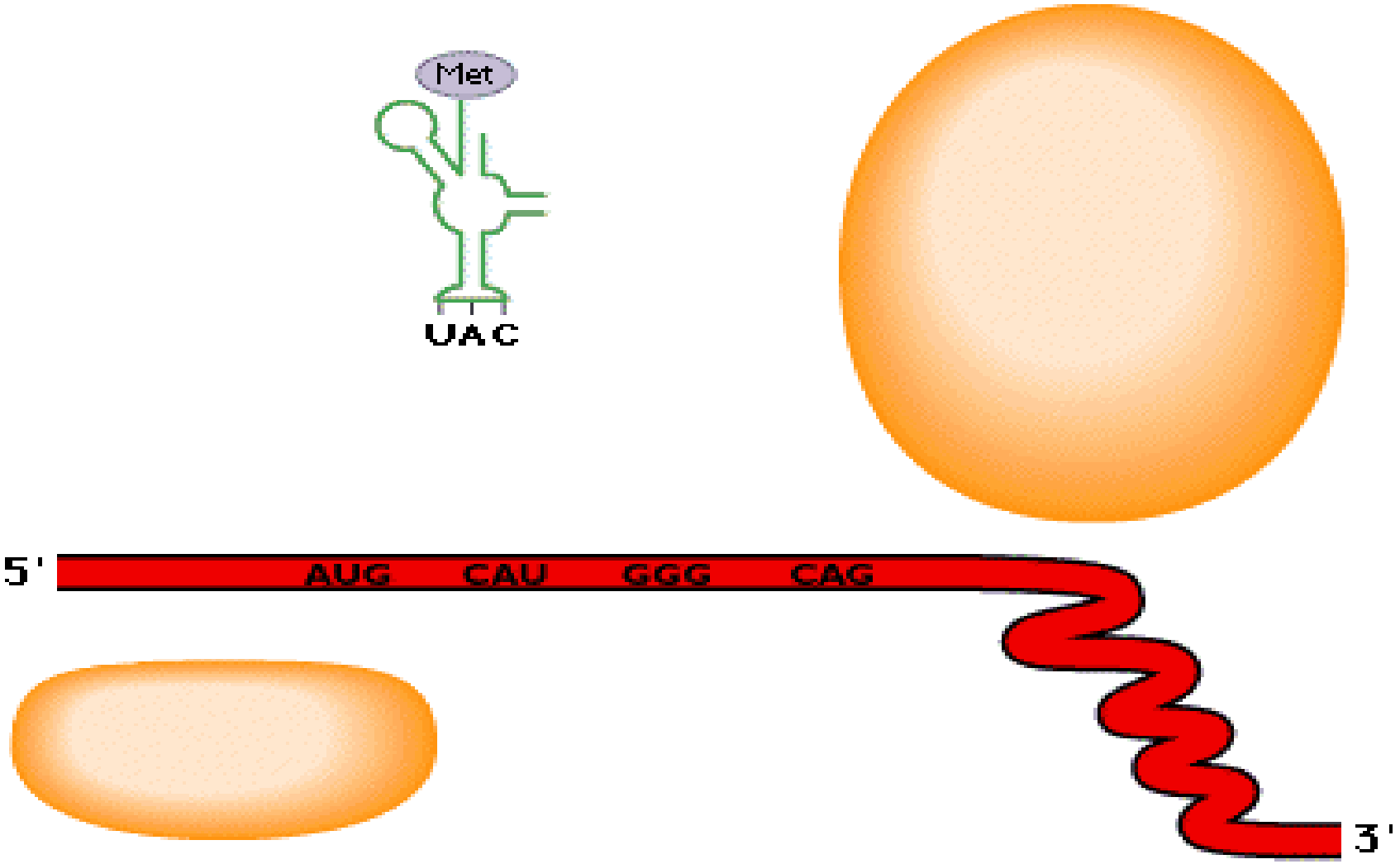
Methionine / Asparagine / Aspartic Acid / Stop



Protein Synthesis


How Proteins Are Made

Protein synthesis in motion



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