

- Translation = Protein Synthesis
  - o Make specific amino acid sequence from unique mRNA sequence
  - o Polysome = polyribosome
  - o Polypeptides are built on the ribosome on a polysome
  - o 4 steps of translation:
    - 1. Add amino acid to tRNA: activation
      - attaches at 3' end
      - tRNA → aa-tRNA
      - loops unpaired bases
      - aminoacyl-tRNA synthase is enzyme
      - each responsible for one amino acid but can recognize more than one tRNA
      - can recognize one base pair or 10 or more
    - 2. Assemble players: initiation
      - EPA are tRNA molecules
      - E is exit site
      - A is aminoacyl-tRNA binding site
      - P is peptidyl-tRNA binding site
      - Prokaryotes have 2 MET t-RNA
        - N-formyl = initiation

- MET-tRNA = internal
      - Eukaryotes have initiator MET and normal MET
      - Shine-Delgarno sequence = Ribosome binding site
      - mRNA = 5-3
      - rRNA = 3-5 and U instead of A
    - 3. Add new amino acids: elongation
      - peptide bond forms via peptidyl transferase = ribosome
      - aa-tRNA ester bond is negative free energy and drives peptide bond formation
      - enters A and exits P
      - 4NTP to make 1 peptide
    - 4. Stop the process: termination
      - stop codon
      - release factor via a protein
  - o Summary
    - Aminoacyl-tRNA = enzyme for aa activation
    - Goes to A site
    - Growing polypeptide on P site
    - Exits on E site
- Genetic Code
  - o Is sequence of nucleotides in DNA

- o BUT SHOWN as mRNA code
  - o Specifies sequence of amino acids
  - o Code ratio: #n per amino acid
    - TRIPLET NUCLEOTIDE CODE (UUU)
      - $1n = 4$  singlets
      - $2n = 16$  doublets
      - $3n = 64$  triplets
  - o Ochoa: polynucleotide phosphorylase into synthetic mRNA
  - o Marshall Nirenberg: synthetic mRNA in in-vitro
  - o 64 possible codons
    - 61 amino acid
    - 1 initiator AUG (nf-MET)
    - 3 stop codons (UGA, UAA, UAG)
  - o Anomalies give "wobble"
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- Genetic Change
    - o Change in DNA nucleotide sequence = CHANGE in MRNA
    - o Significant because of mutation and recombination
  
  - Mutation: