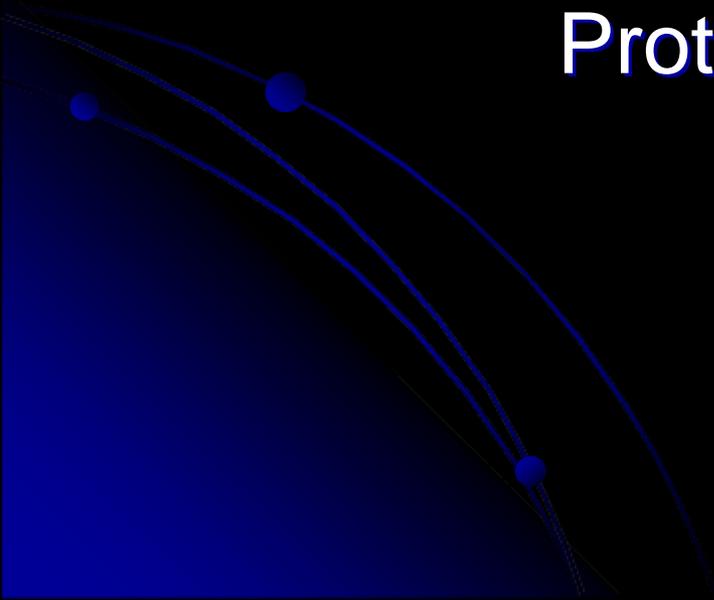
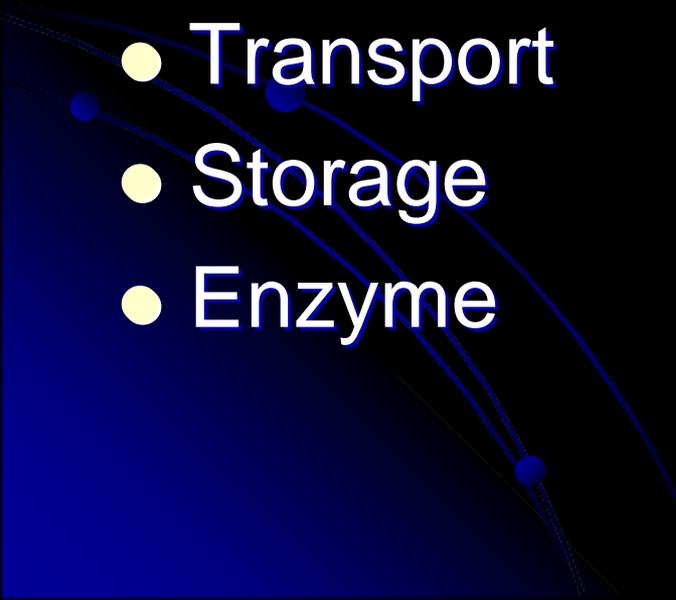


# Proteins

Proteios = First Place



# 7 Classes of Proteins

- Structural
  - Defense
  - Signal
  - Contractile
  - Transport
  - Storage
  - Enzyme
- 

# Structural

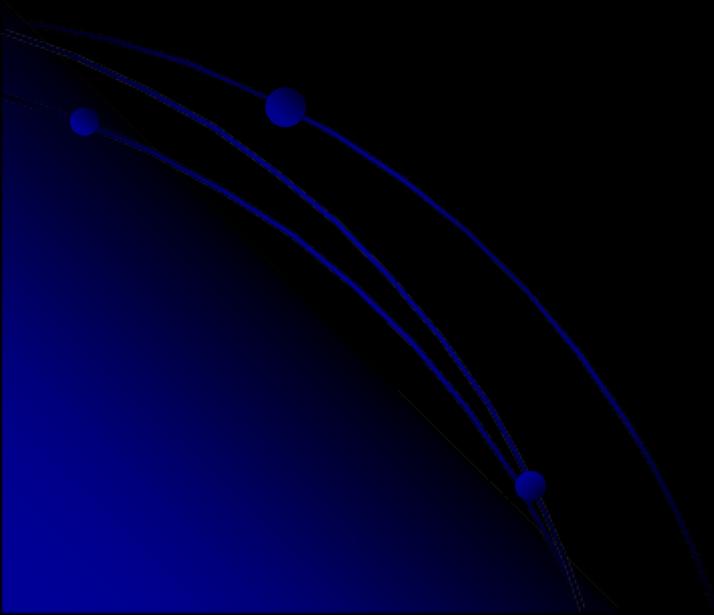
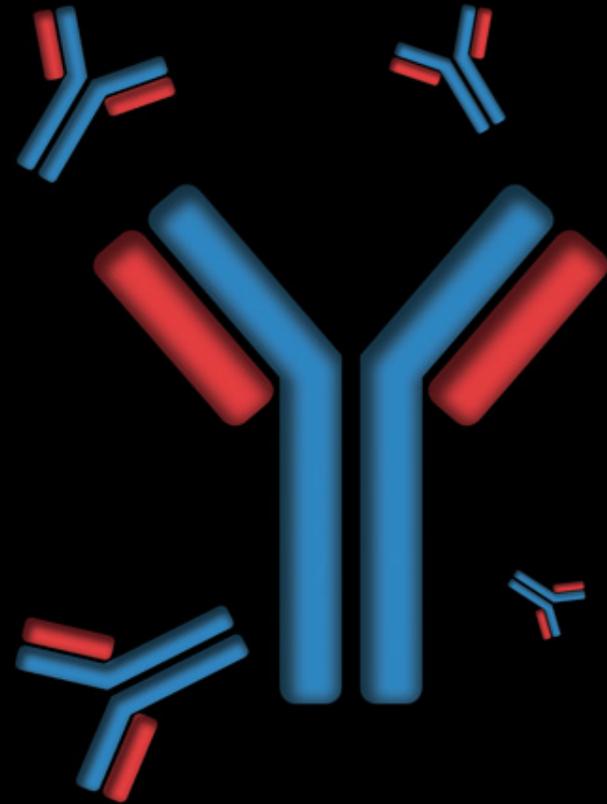
Support- includes Keratin, which makes up hair and nails.

- Keratin also helps anchor cell parts
- Collagen fibers, which support many organs.



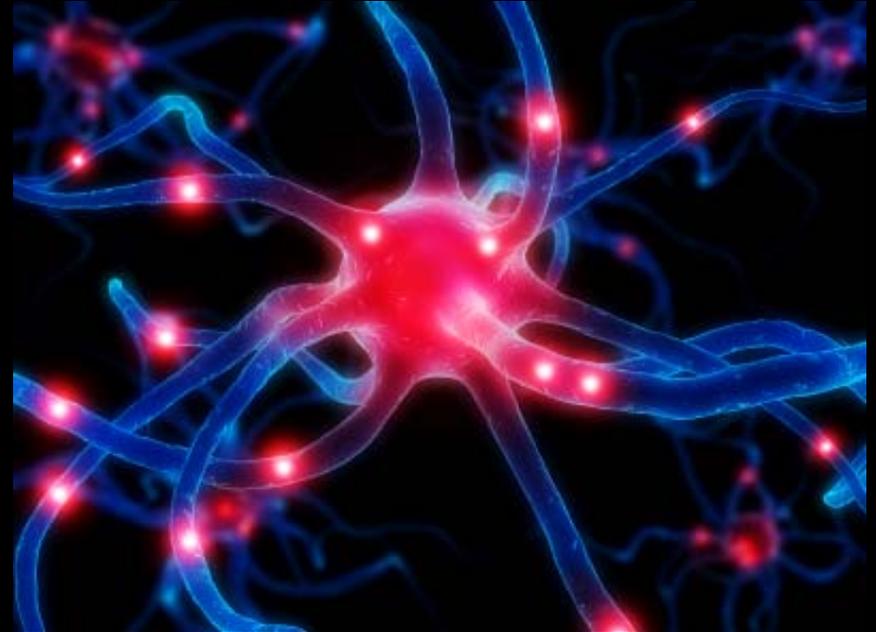
# Defense

- Antibodies that prevent infection



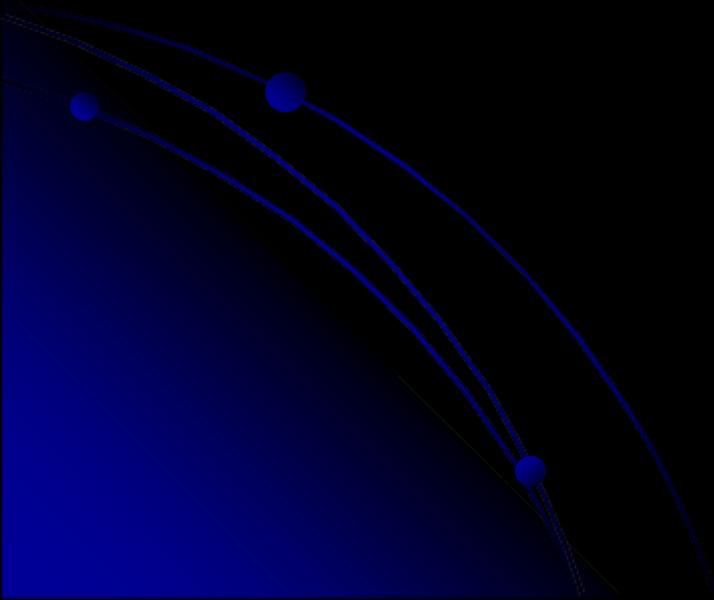
# Signal

- Hormones
  - Insulin signals cell to take in sugar.



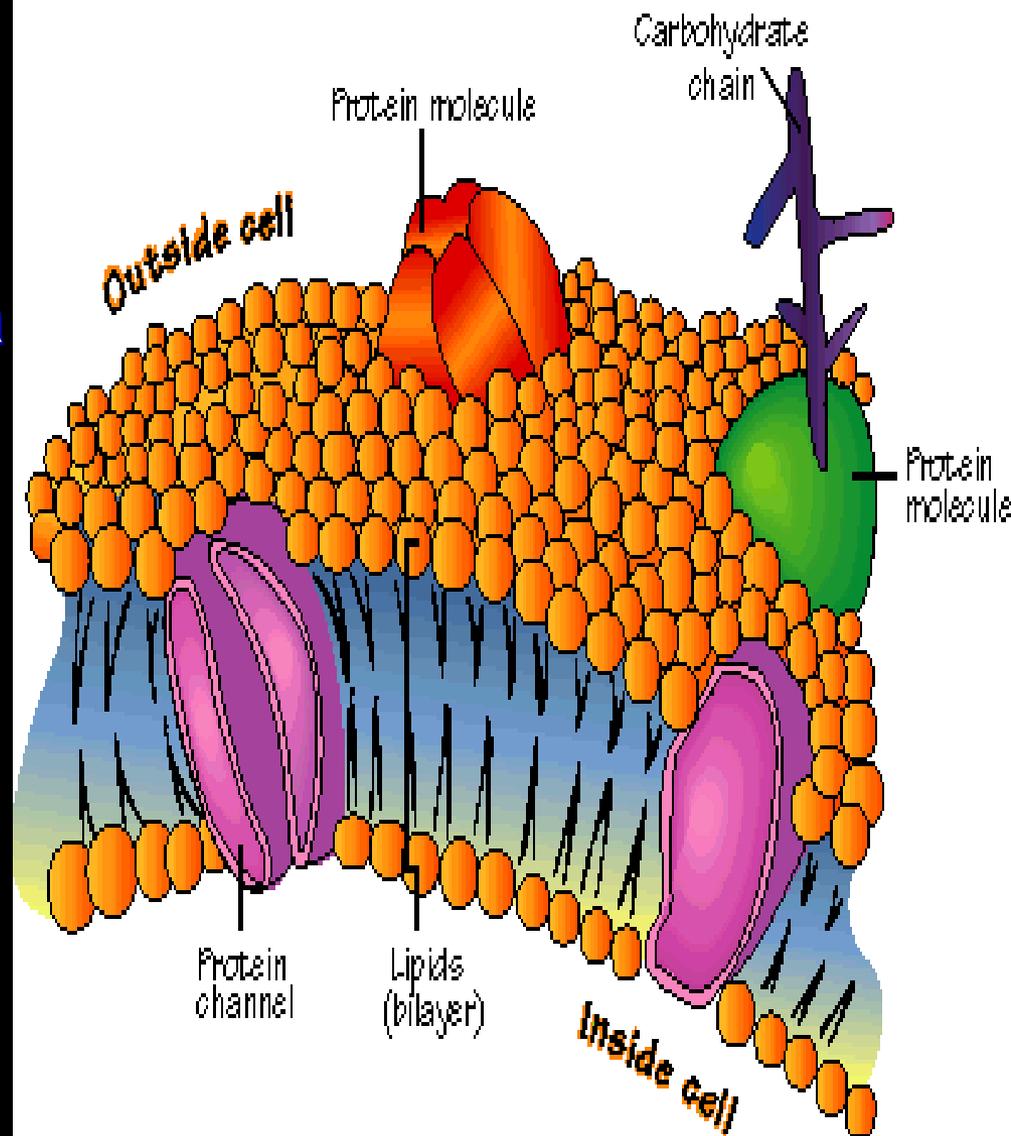
# Contractile Motion

- Provided by myosin and actin proteins that make up the bulk of the muscle.



# Transport

- Channel and carrier proteins in the plasma membrane and hemoglobin, that carries oxygen in red blood cells.



# Storage

- Proteins in seeds provide food for plant embryos
- Egg yolk provides energy for developing chick



# Enzymes

## # 1 protein

- Proteins that act as organic catalyst to speed up chemical reactions within a cell; regulates all chemical reactions
  - 1000's of different enzymes in the human body

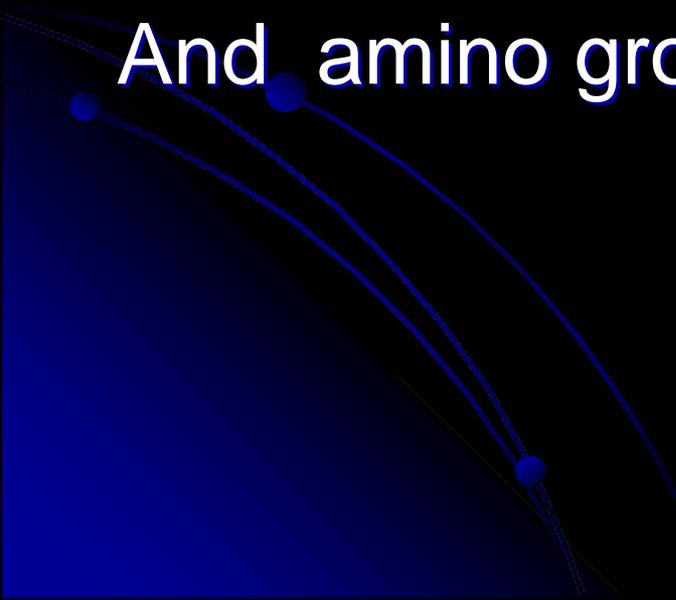


# What makes up all proteins?

- Amino acids

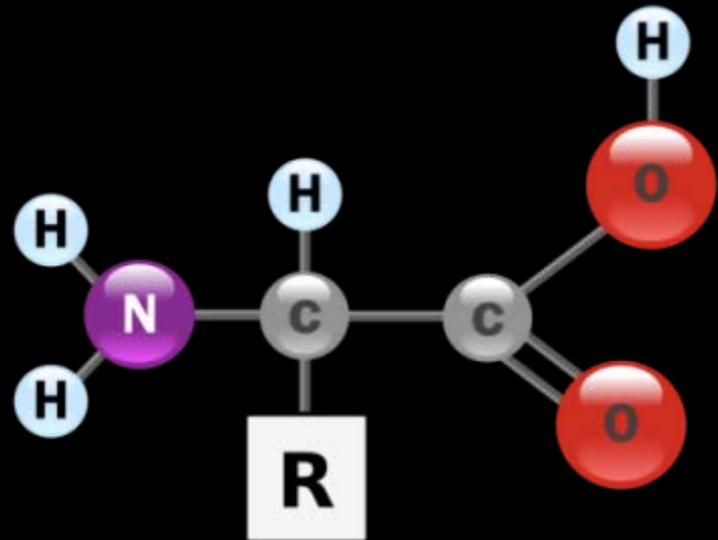
All amino acids contain an  
acidic group -----COOH (carboxyl)

And amino group ----NH<sub>2</sub>



# What makes an amino acid different?

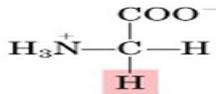
- R Group
  - The R group can be hydrophobic (non polar) or hydrophilic (polar)



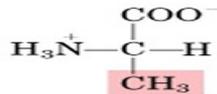
# Amino Acids

## Twenty standard Amino Acids

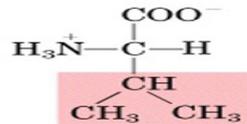
### Nonpolar, aliphatic R groups



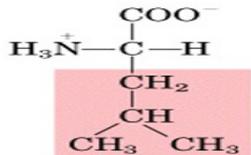
Glycine



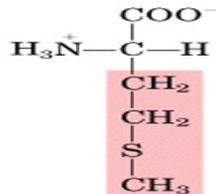
Alanine



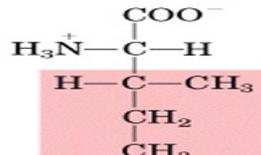
Valine



Leucine

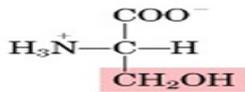


Methionine

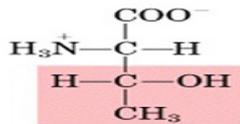


Isoleucine

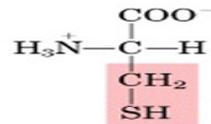
### Polar, uncharged R groups



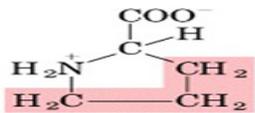
Serine



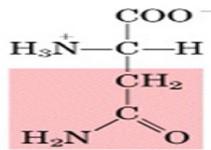
Threonine



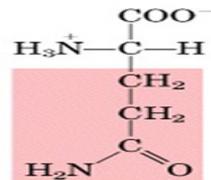
Cysteine



Proline

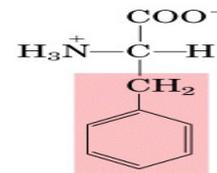


Asparagine



Glutamine

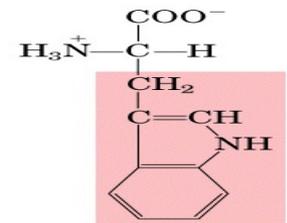
### Aromatic R groups



Phenylalanine

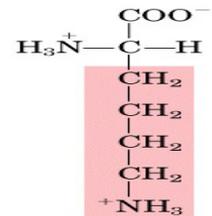


Tyrosine

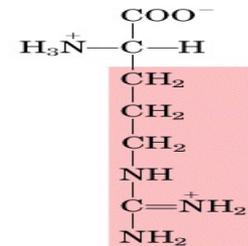


Tryptophan

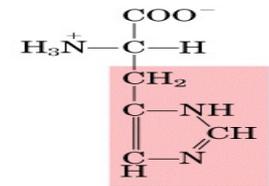
### Positively charged R groups



Lysine

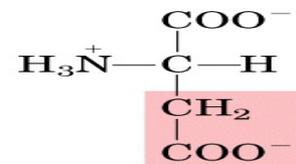


Arginine

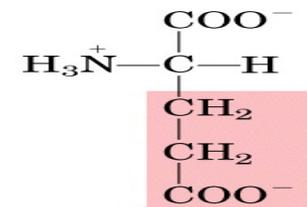


Histidine

### Negatively charged R groups



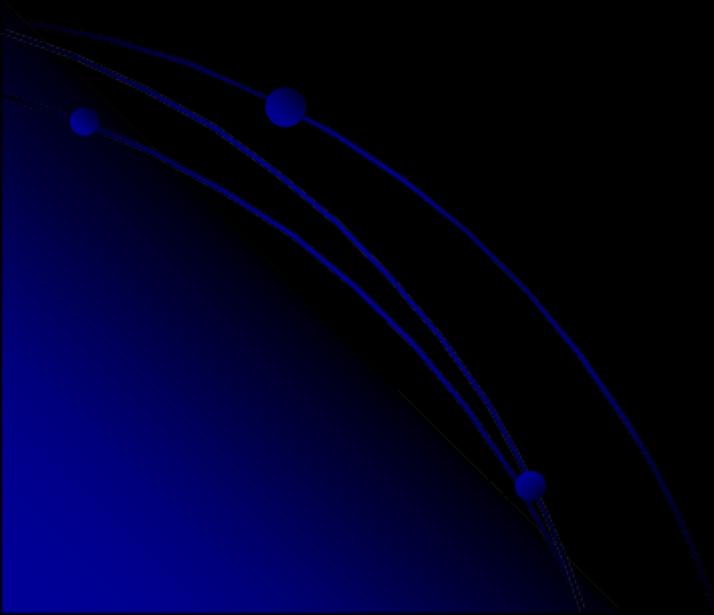
Aspartate



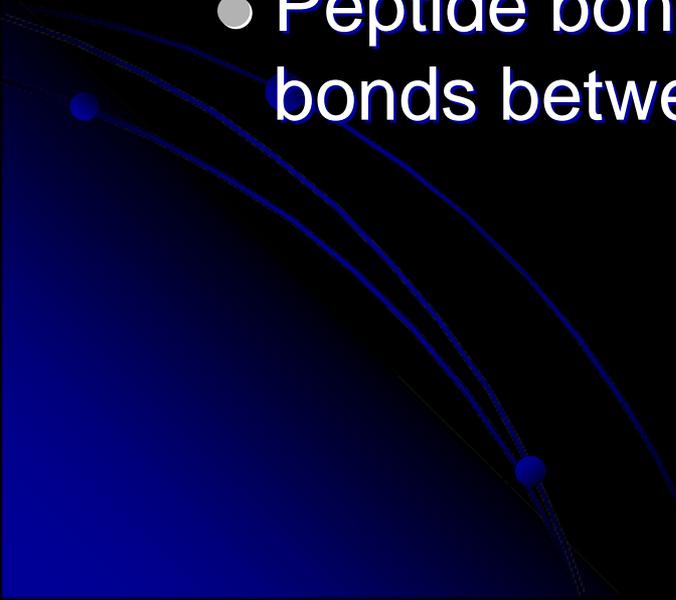
Glutamate

# What makes proteins different?

- Sequence of amino acids
  - Coded by our DNA

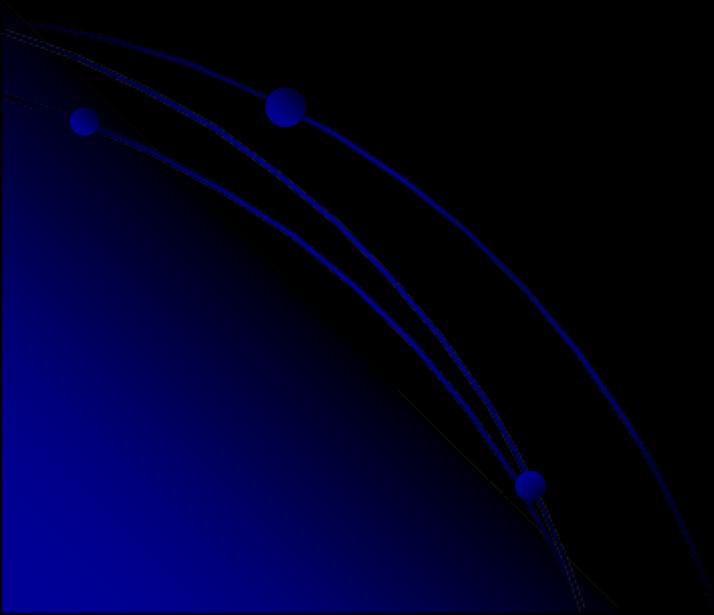


# Peptides

- Peptide is two or more amino acids joined together
  - Polypeptides are chains of many amino acids joined by peptide bonds
    - Peptide bonds link amino acids – covalent bonds between amino acids and peptides
- 

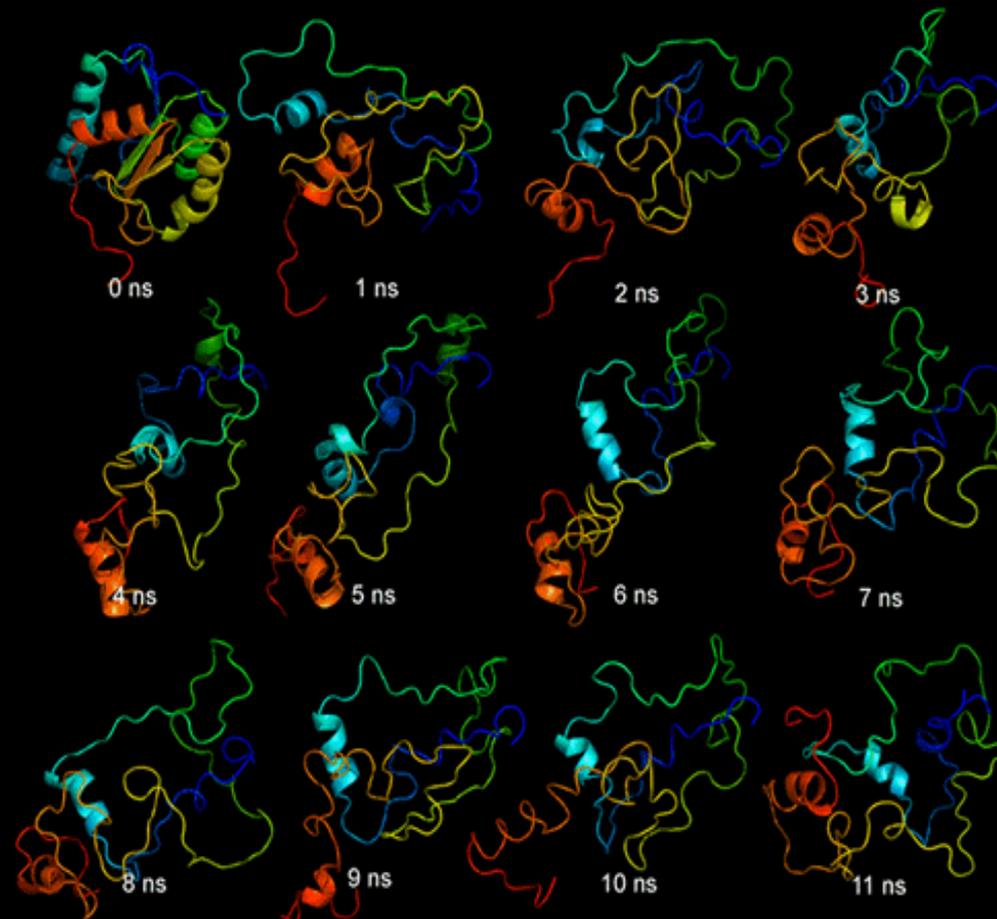
# Peptides Continued

- Most polypeptides are at least 100 amino acids long and some are 1000's.
  - Dehydration synthesis to link together
  - Hydrolysis to take apart



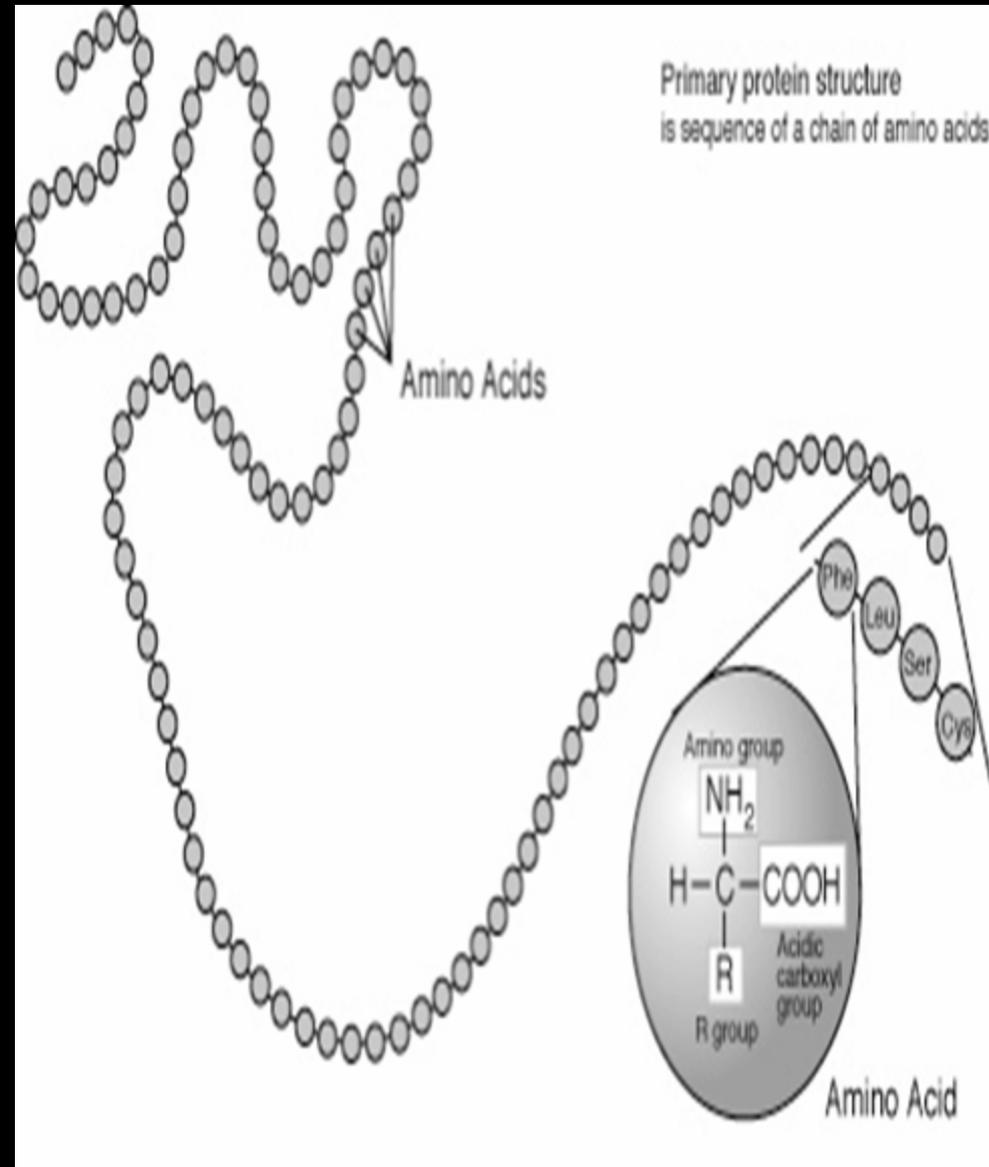
# Levels of Protein Structure

- Shape of the protein determines the function of the protein in the organism



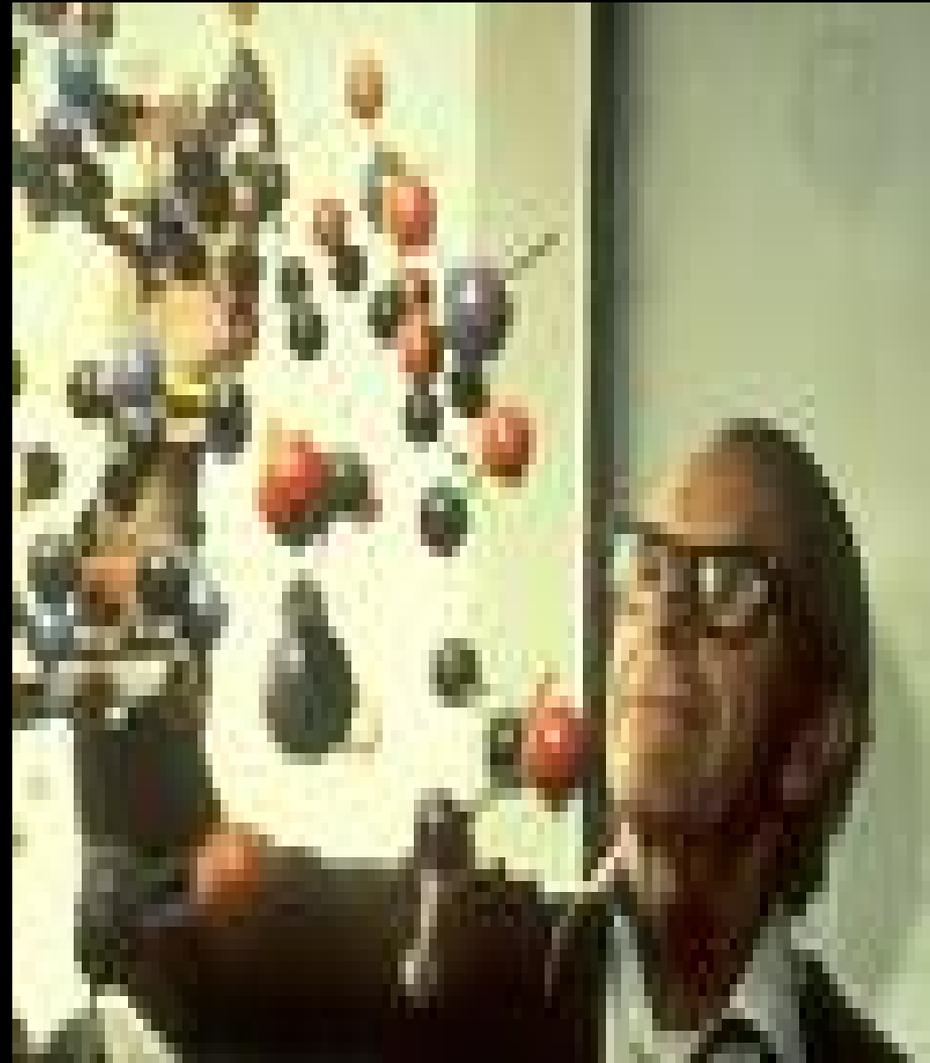
# Primary Structure

- Sequence of Amino acids joined by peptide bonds.
  - Inherited genetic information.
  - Slight change can alter the function of a protein, change in one amino acid.
    - Sickle cell anemia



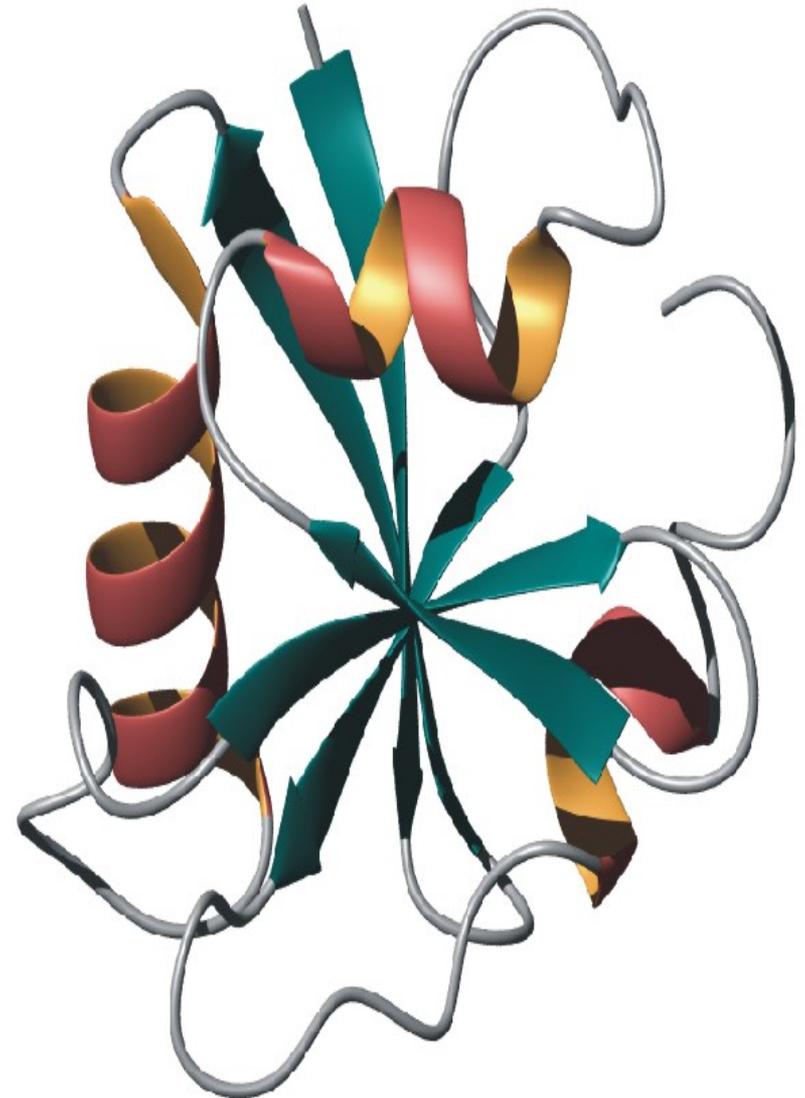
# Frederick Sanger

- Scientist that determined the first protein sequence with the hormone insulin, 1953
- Noble Peace Prize in chemistry. 1958



# Secondary Structure

- Polypeptide takes a particular shape.
- Coiling results in the secondary structure.
  - Alpha helix
    - Silk protein of a spider's web
      - Surgical thread
      - Fishing line
      - Bullet proof vest



# Linus Pauling and Robert Corey

- Scientist that discovered the alpha helix.
- Linus Pauling- Only person to receive two unshared Nobel Peace Prizes.
  - Determined how hemoglobin carries oxygen
    - Abnormal hemoglobin causes sickle cell anemia
  - Ban on nuclear testing

1952  
1954



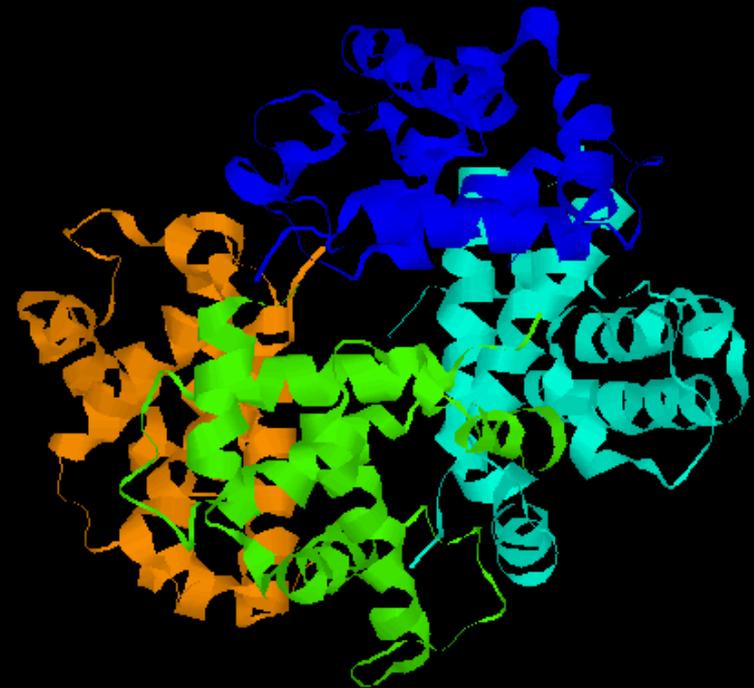
# Beta Sheet

- Second pattern to be discovered
  - Beta keratin includes keratin of feathers, hooves, claws, beaks, scales, horns.



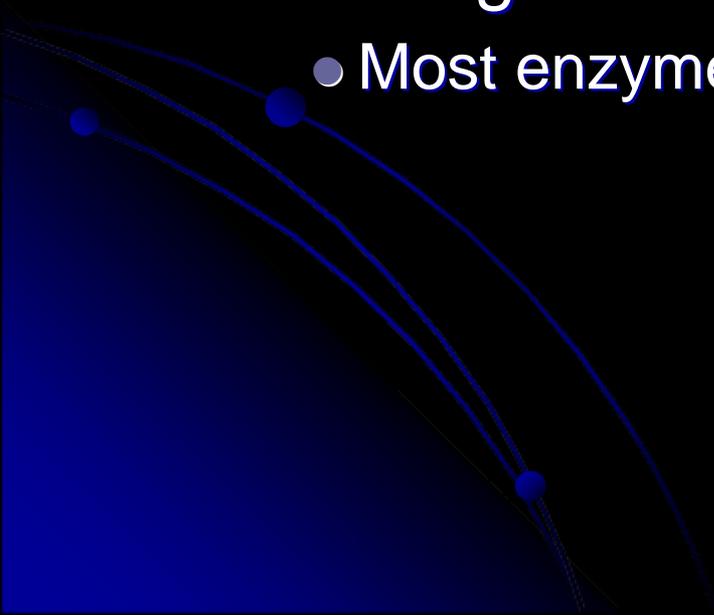
# Tertiary Structure

- Proteins are folded, due to various interactions between the R groups of the amino acids
  - Three dimensional shape
  - Usually globular or fibrous

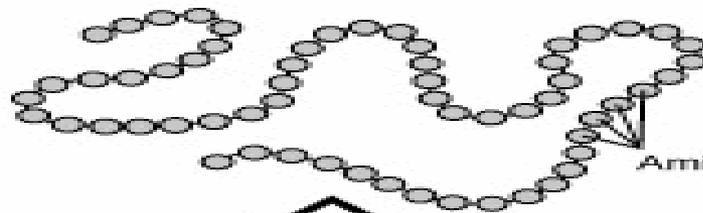


# Quaternary Structure

- Two or more polypeptides combine.
  - Collagen
    - 40% of the protein in the human body.
      - Connective tissue, bone, tendons, ligaments
  - Hemoglobin
    - Most enzymes have quaternary structure.



# Protein Structure



**Primary protein structure**  
is sequence of a chain of amino acids

Amino Acids

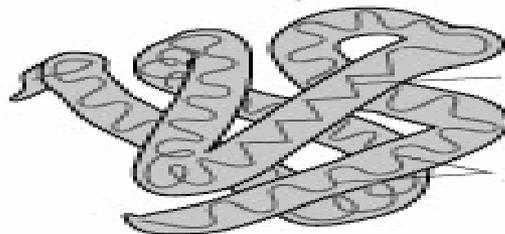


Pleated sheet



Alpha helix

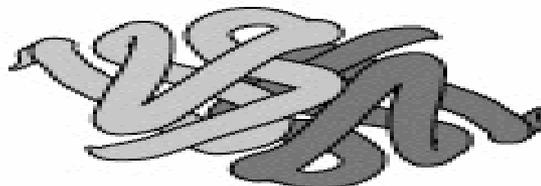
**Secondary protein structure**  
occurs when the sequence of amino acids  
are linked by hydrogen bonds



Pleated sheet

Alpha helix

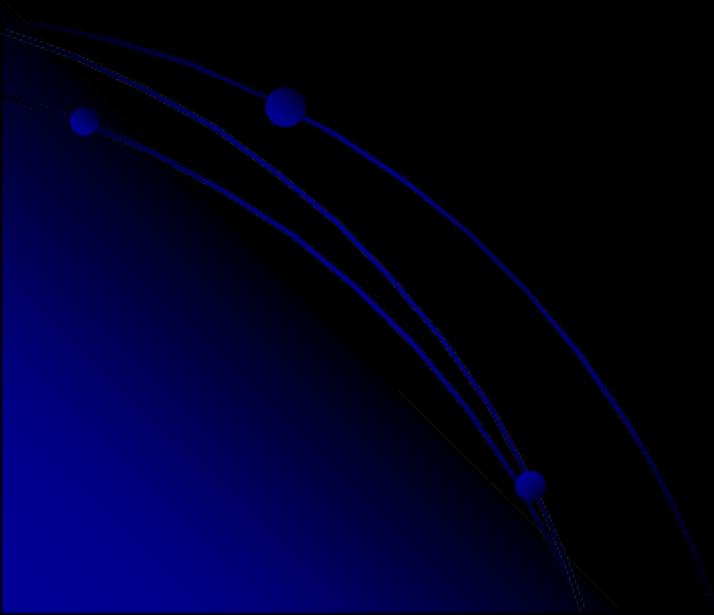
**Tertiary protein structure**  
occurs when certain attractions are present  
between alpha helices and pleated sheets.



**Quaternary protein structure**  
is a protein consisting of more than one  
amino acid chain.

# Denaturing Proteins

- Polypeptide chains unravel losing it's shape.
- Once a protein loses its shape it cannot function.



# Factors that Effect Proteins

- pH
  - Change in temperature
    - Cooking an egg
  - Change in salt concentration
  - Chemicals that destroy hydrogen bonds
    - Adding acid or base to milk
- 