

# MACROMOLECULES: PROTEINS

rvsd 30 Sept 1996, 2 October 1996, 29 Sept 99, 26 Sept 01, 30 Sept 02, 29 Sept 03, 26 Sept 05, 24 Sept 07, 29Sept08, 27Sept09  
BKH, 6<sup>th</sup>, 40-53, BKHB 7<sup>th</sup>: 40-53. (Read 2nd half 1st paragraph p 40 for summary of self assembly),

<b>Protein functions:</b>	enzymes	motility	transport	receptor
	structure	regulation	hormone	defense
				storage

**Linear polymer of amino acids**, connected by peptide bonds

Amino acids have one **asymmetric carbon**, levorotary (= L)(D AAs in odd peptides, bacterial peptidoglycan)

**Drawn:** vertical groups point away, horizontal groups toward: NH<sub>2</sub> left, COOH right, *functional group below*  
All are **zwitterions**. (Use model kits for students to put together amino acids.)

<b>Properties of AAs depend on side chain</b> (R group)	<b>learn these eight example structures:</b> (P. 44)	
8 are hydrocarbon, thus	hydrophobic	glycine, alanine, phenylalanine
7 are	polar	serine, tyrosine, cysteine
5 are	ionic	aspartic acid, lysine

Proteins unidirectional, write N terminal to C terminus, joined by peptide bonds (dehydration condensation, p 45)

**Protein structure: (p 48)**

**primary:** Linear sequence of amino acids (sequence determines everything else) (p 48 for insulin)

**secondary:** local interactions related to H bonding between peptide bonds, **not** side chains. Highly predictable.  
 $\alpha$  **helix à la** Pauling and Corey, 1951 (p 49), keratin,  
 $\beta$  **pleated sheet:** fibroin in silk, troughs and peaks  
**fibrous proteins** have repeating structure, helix and pleated

See excellent 3D demo of ribonuclease (5rsa) at: (hexokinase = 2yhx, collage = 1k6f)  
<http://www.rcsb.org/pdb/static.do?p=Viewers/QuickPDB/quickPDBApplet.jsp?structureId=5RSA>

**tertiary:** depends on side chains, non-repetitive:  
H bonds, ionic bonds, hydrophobic bonds, disulfide (p. 45)  
not easily predictable  
disulfide bridges: rearrange for permanent wave:  
1 reduce  
2 set  
3 oxidize

**globular proteins** rely more on tertiary

**quaternary:** multimeric proteins, above 50,000 MW same forces determine 4th level as third.

assembly spontaneous: **Self Assembly**

Folded structure is critical for the properties of the protein.

Disrupted structure = denatured, often makes protein insoluble  
heat: cook eggs, bake a roast (blood gels and turns brown)  
acid: cerviche, pickled meats,  
salts: salami, etc.

Example of ricotta: acidification, bring to near boiling.