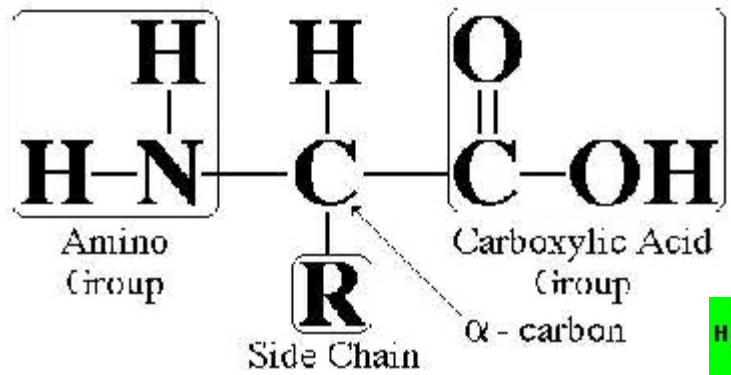


MACROMOLECULES: PROTEINS

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, 27Sept10, 26Sept11
 BKH, 6th, 40-53, BKHB 7th: 40-53.

(Read 2nd half 1st paragraph p 40 for summary of self assembly),



Protein functions:

enzymes	regulation	receptor
structure	transport	defense
motility	hormone	storage

DEFINITION OF PROTEIN: Linear polymer of amino acids, connected by peptide bonds

Amino acids have one **asymmetric carbon**, levorotary = "L". ("D" AAs in odd peptides, eg: peptidoglycan)

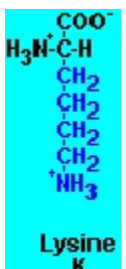
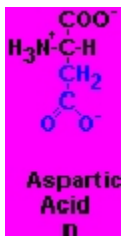
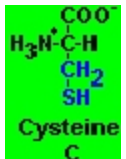
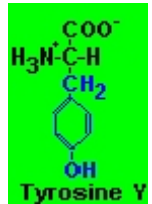
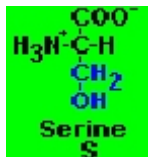
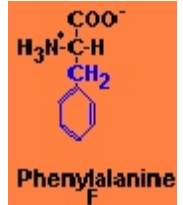
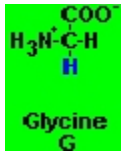
Drawn: vertical groups point away, horizontal groups toward: NH₂ left, COOH right, *functional group below*
 All are **zwitterions**. (STUDENTS: Use model kits to construct amino acids.)

Properties of AAs depend on side chain (R group)

8 are hydrocarbon, thus	hydrophobic
7 contain O, N or S (nonionized)	polar
5 have either -COOH or -NH ₂	ionic

learn these eight example structures: (P. 44)

glycine, alanine, phenylalanine
 serine, tyrosine, cysteine
 aspartic acid, lysine



Proteins unidirectional, 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: H bonding between peptide bonds, **not** side chains. Highly predictable.
 α **helix** à la Pauling and Corey, 1951 (p 49), keratin,
 β **pleated sheet:** fibroin in silk, troughs and peaks

fibrous proteins have repeating structure, helix and pleated

See excellent 3D demo of example proteins:

ribonuclease =	http://www.pdb.org/pdb/explore/jmol.do?structureId=5RSA&bionumber=1
collagen =	http://www.pdb.org/pdb/explore/jmol.do?structureId=1k6f&bionumber=1
hexokinase =	http://www.pdb.org/pdb/explore/jmol.do?structureId=2yhx&bionumber=1 ,

tertiary: depends on side chains, non-repetitive: (p. 45)

H bonds, ionic bonds, hydrophobic bonds, disulfide
 not easily predictable

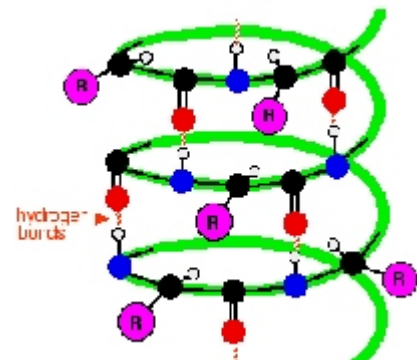
disulfide bridges: rearrange for permanent wave:

- 1 reduce
- 2 set
- 3 oxidize

globular proteins rely more on tertiary

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

same forces



Self Assembly In water, the protein spontaneously folds itself:

Folded structure is critical for the properties of the protein.

Disrupted protein 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, albumin ppt.

