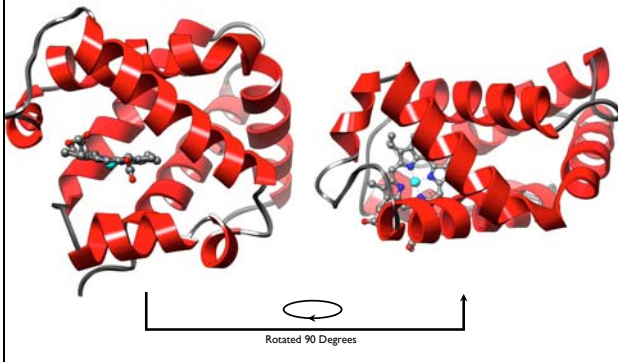
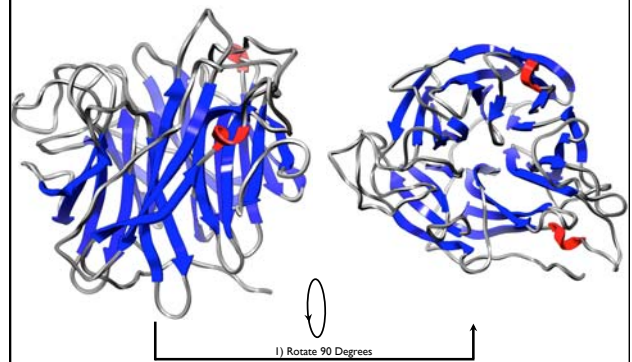


# Lecture 1: Crystals, symmetry

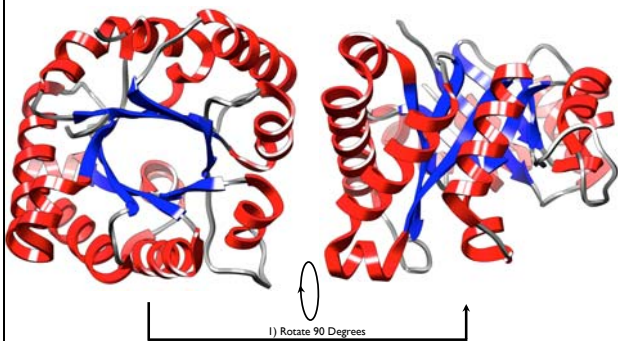
Tertiary Structure: An Example of an All-Alpha Protein, Hemoglobin Subunit



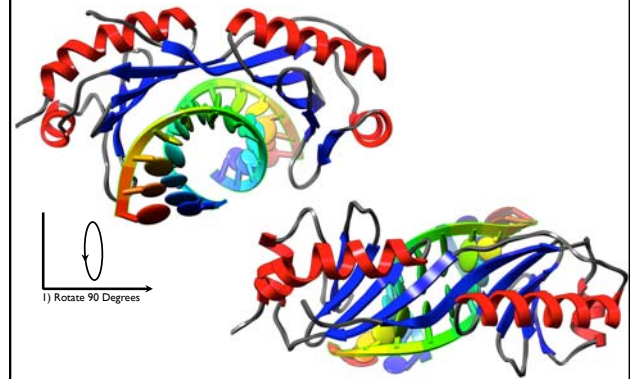
Tertiary Structure: An Example of an All-Beta Protein, Flu Virus Neuraminidase



Tertiary Structure: An Example of an Alpha/Beta Protein, Triose Phosphate Isomerase



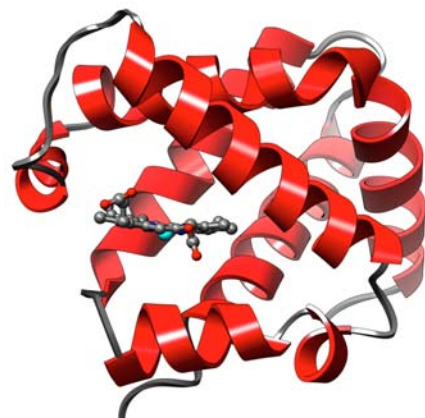
Tertiary Structure: An Example of an Alpha + Beta Protein, TATA Binding Protein



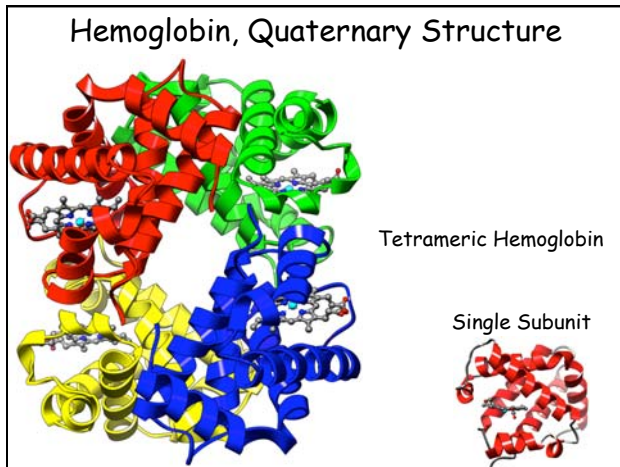
## From Tertiary to Quaternary Structure: Hemoglobin as an Example

- Quaternary structure -- the relative arrangement of two or more individual polypeptide chains
- Protein assemblies can contain one type of polypeptide (homo-oligomer) or multiple types (hetero-oligomer)
- Example: Hemoglobin (oxygen carrier in blood)
  - Hemoglobin is a hetero-tetramer composed of two alpha subunits and two beta subunits

Hemoglobin, Tertiary Structure



# Lecture 1: Crystals, symmetry

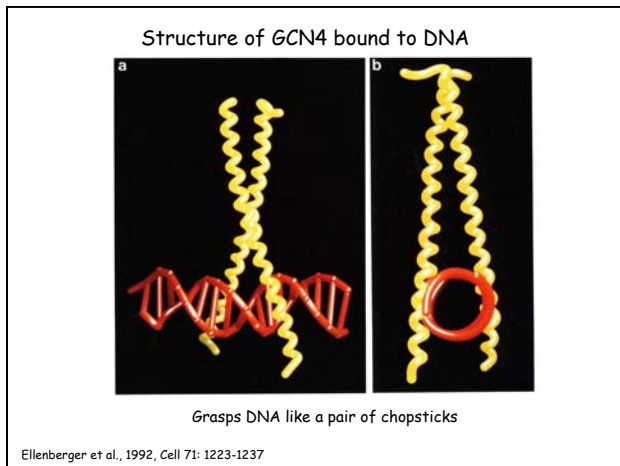


### PyMol Molecular Viewer

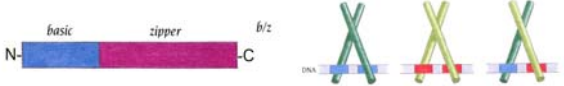
Will be used for PS2 and other sets throughout the course

Tutorial on Bi1 website

Demo by Toni Lee on Friday, April 10 4-6pm  
Here: (119 Kerckhoff)

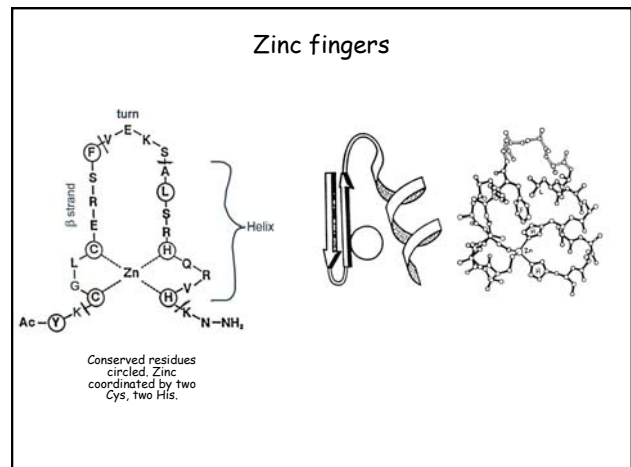
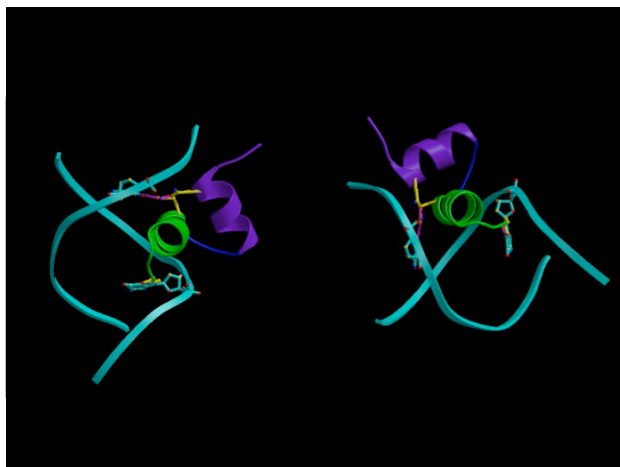


### Leucine zippers



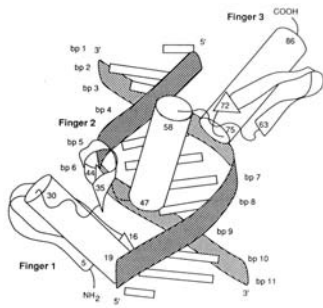
- Leucine region arranged as parallel coiled coil.
- Only basic region interacts with DNA. Leucine repeat is a dimerization motif that allows two molecules to dimerize.
- Formation of different Leu zipper homo- and heterodimers allows combinatorial action of gene regulatory proteins.

- Advantages of binding as a dimer:
  - Doubles DNA contact area
  - Tightly associated dimers can bind at more dilute concentrations than monomers.



# Lecture 1: Crystals, symmetry

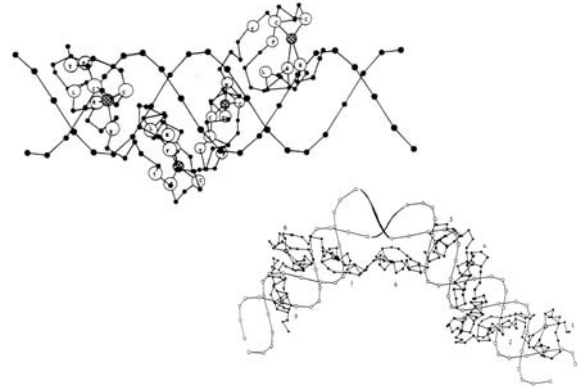
## Zinc finger/DNA complex



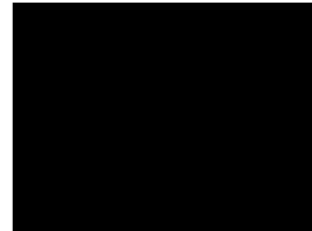
- Each finger contacts 3 bp in major groove.
- Fingers are similar (0.45 Å to 0.87 Å rmsd).

Pavletich & Pabo, 1991, Science 252: 809-816.

## Zinc fingers bind as modules to adjacent sites on DNA



## Model of HIV protease



[http://mgl.scripps.edu/projects/tangible\\_models/movies](http://mgl.scripps.edu/projects/tangible_models/movies)