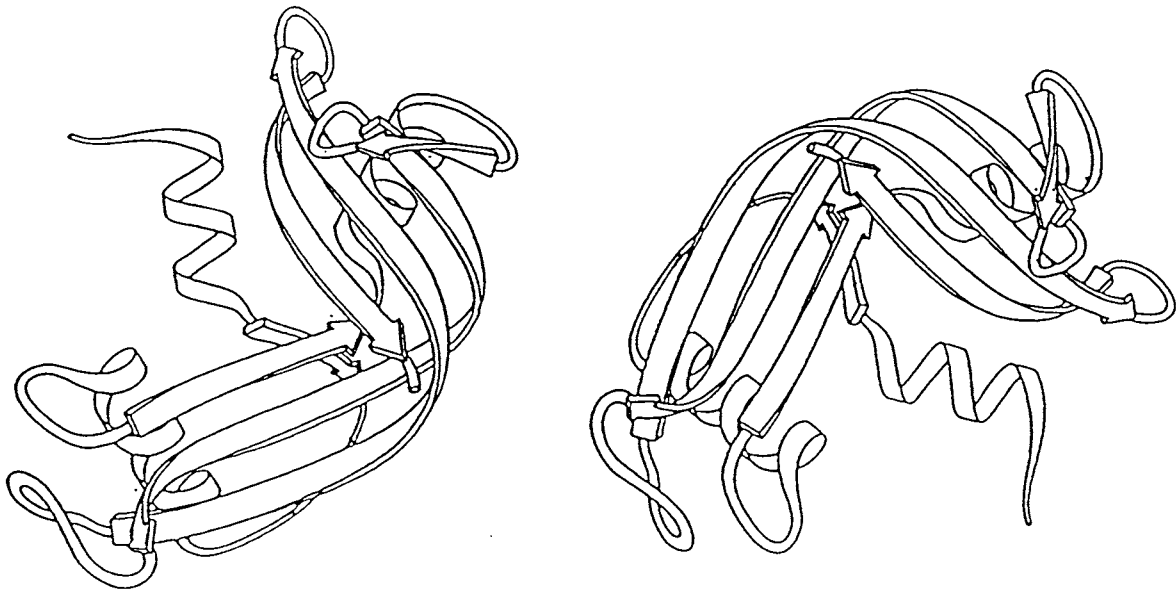


## Problem Set #1:

(1) What type of  $\beta$ -turn should be preferred as the direct connection between two antiparallel  $\beta$ -strands; ie, in a  $\beta$ -hairpin motif? Explain your answer in structural terms.

(2) Which of the two structures shown below is the correct structure for Ribonuclease A? List as many structural reasons as you can think of to justify your choice.

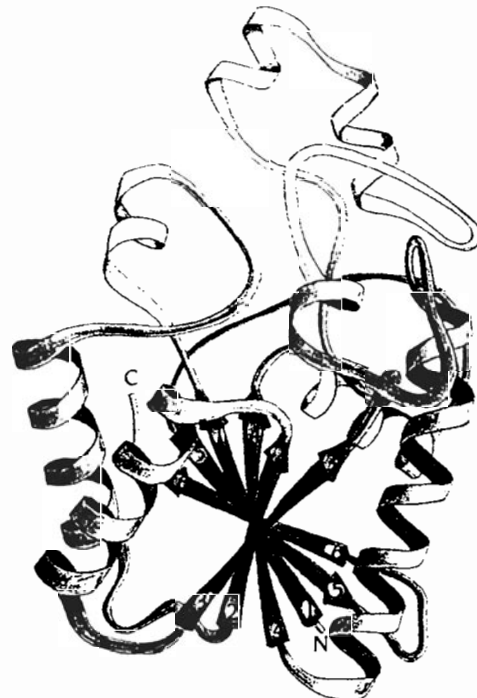
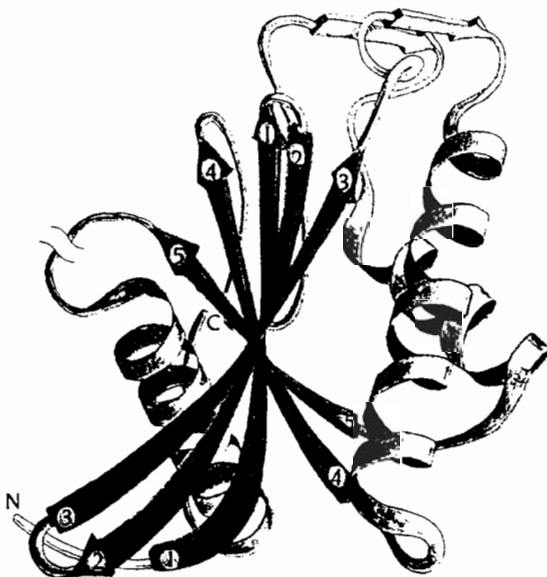
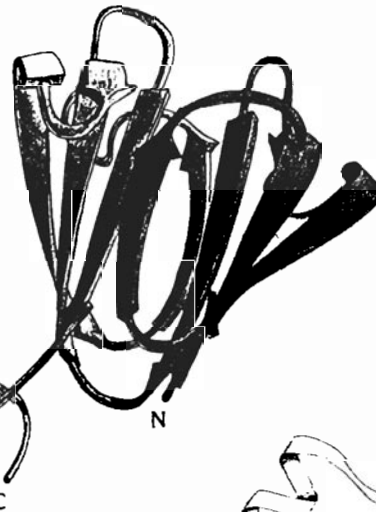
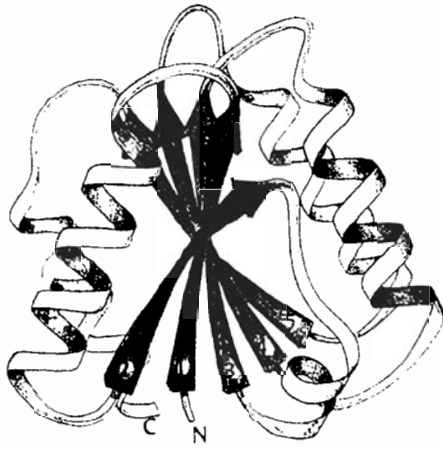


(3) Segments of the Fos and Jun proto-oncogene proteins have been shown to form heterodimeric coiled coils in solution. The "leucine-zipper" portions of the sequences that are thought to directly interact are given below.

Fos      LQAETDQLEDKKSALQTEIANLLKEKEK  
Jun      LEEKVKTLKAQNSELASTANMLREQVAQ

Plot each sequence on a helical wheel diagram. What pattern in the sequences might lead you to suspect a coiled coil structure? Why? Should a coiled coil of two helices have a right- or left handed supercoil?

(4) Draw topological diagrams with directed arrows for strands and tubes for helices to represent each structure shown below. Analyze each structure in terms of the motifs mentioned in class.



(5) Draw helical wheel diagrams to rationalize the Rose group's two motifs for alpha helix termination by glycine. The original article on this subject can be found in *Science*, 264, 1126–1130 (1994).

(6) Suggest a structural reason for the marked preference of "Greek Key" motifs to adopt one of the two possible mirror image topological arrangements.