To make a toober model of a Zinc finger
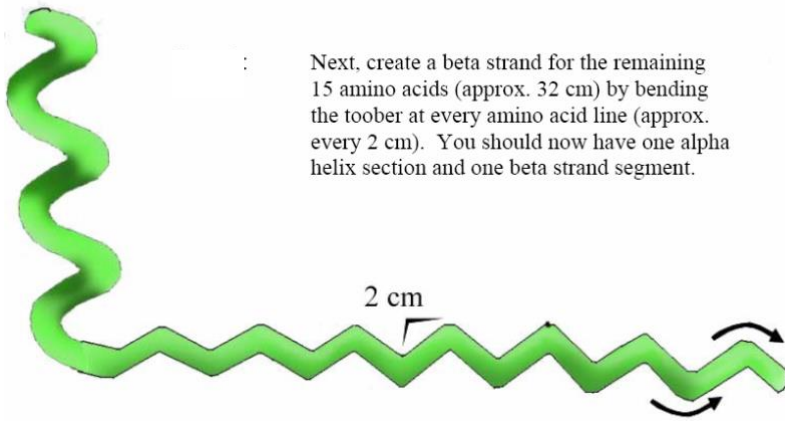
Visualizing a Zinc finger using RasMol
1. Search and download the PDB file 1ZAA from www.pdb.org
2. Review the Structure Summary page to learn about the structure in this file (how many chains are present in the file, whether these chains are protein or nucleic acid etc.)
3. Open the file 1ZAA in RasMol. To get a sense of what is contained in the file use the pull down menu options
   a. Display > Ribbons
   b. Color > Chain. The 3 chains in the file are colored in different colors.
   c. Color > Structure. This shows 3 Zinc finger domains in the protein chain.
4. Select and Display only Zinc finger 1
   a. RasMol> Restrict 4-31and :C (type this in the RasMol terminal window)
   b. Pull down menu Display > Backbone
5. Display Zn ion in this Zn finger
   a. RasMol> Select Zn201
   b. RasMol> Spacefill
6. Display Cys and His residues around the displayed Zn atom
   a. RasMol> Select (Cys or His) and (4-31) and :C
   b. RasMol> Wireframe 80
   The residues Cys7, Cys12, His25 and His29 should be displayed
7. Display the other residues
   a. RasMol> Select Leu22 or Arg18 or Phe16
   b. RasMol> Wireframe 80
   c. Color CPK
8. What do you think about the location of these residues in terms of
   a. The hydrophobic-hydrophilic properties of their side chains
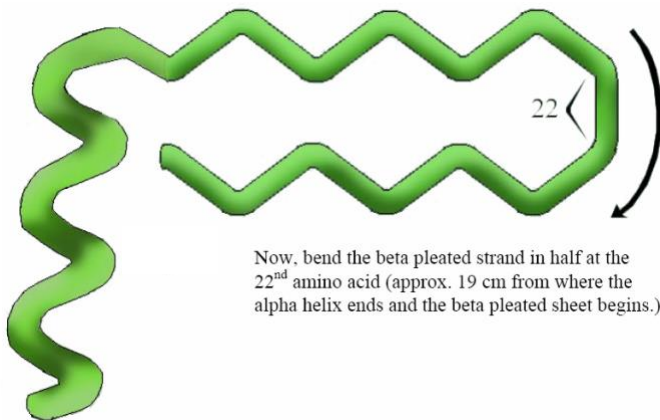   b. The function of the Zinc finger

Making the toober model
1. Decide the scale for the model
   a. Use a tape measure or ruler to measure the toober(s) provided and establish a scale for the model. In this case the toober is approximately 56 cm long and corresponds to 28 amino acids (2cm/amino acid).
   b. If you wish, you can use a piece of paper to match the length of the toober and mark each amino acid on this protein map. This may be helpful in building the model.
2. Making the helix
   a. Bend the length of toober corresponding to the first 13 amino acids into a helix
   b. The helix should be right handed (image that your helix is a spiral staircase, so if you climb up that staircase, your right hand should be on the outside railing).
3. Making the sheet

a. For the remaining 15 amino acids bend the toober at every amino acid (approximately every 2 cm) to make a zig-zag. This represents the beta strand.

Next, create a beta strand for the remaining 15 amino acids (approx. 32 cm) by bending the toober at every amino acid line (approx. every 2 cm). You should now have one alpha helix section and one beta strand segment.

2 cm

4. Assembling the structure
    a. Bend the beta strand region in half (at around residue 22) and turn the toober at approximately the 14th or 15th residue. This forms the backbone of the zinc finger.

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Now, bend the beta pleated strand in half at the 22nd amino acid (approx. 19 cm from where the alpha helix ends and the beta pleated sheet begins.)

Now, bend the toober segment at the "Turn" (between the 14th and 15th amino acids) so that it resembles the picture shown below.
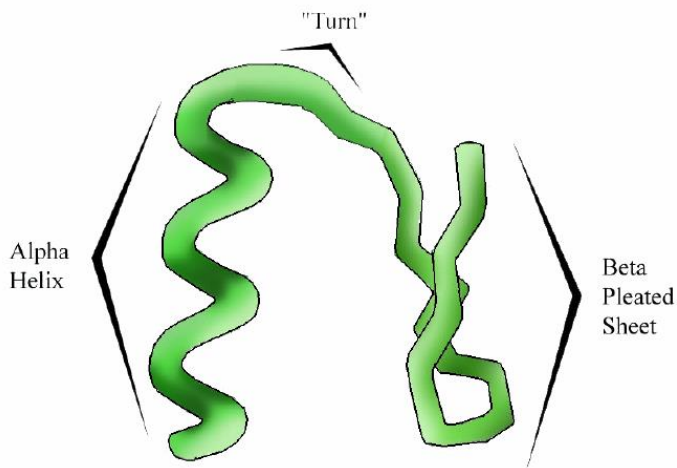
5. Highlighting specific residues in model
    a. Use the colored pipe-cleaners to mark the Cys, His, Phe, Leu and Arg residues (as seen in the RasMol figure). The zinc is bound at the center of the Cys and His residues.
6. Mark the N- and C-termini
    a. The N-terminus is the end near the helix. Insert a blue thumb tack at this end. The C-terminus is at the end of the sheets. Mark this with a red tack.

Other points to consider in building a toober model:
1. If the model is very large and complex you can use the plastic clips provided to stabilize the model
2. If there are more than one chains in the model the same clips may be used to hold the multiple chains together.
3. You can come up with creative ways to display important residues or features in the structure that have an important role in its function.