Modeling Tips for the TATA-Binding Protein

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In Part I of this year's Protein Modeling event, students will design and build a physical model of the TATA-binding protein as featured in the July 2005 RCSB PDB Molecule of the Month. This will be an alpha-carbon backbone model based on Chain A of 1CDW.pdb. Here is a general approach to constructing a model of this protein:

1. Learn About the Protein. Go to the Molecule of the Month (from http://www.pdb.org) and read about the TATA-Binding Protein. Decide what important features of the protein you want to display in your model. Make a list of these features. This is also a good time to examine the 1CDW.pdb file using the link provided on this site, and read about who solved the structure, what university they worked at, and where they published the work.

2. Explore the Protein Using RasMol. Download the 1CDW.pdb file and open it in RasMol. (A copy of RasMol can be downloaded from http://www.rpc.msoe.edu/ScienceOlympiad/rpdownload.php) Display the protein in a backbone format and explore the structure. Find the alpha helices and beta sheets that make up this structure. You can identify specific amino acids by clicking on the alpha carbon (the bends or elbows in the backbone). The identity of each amino acid, and its number in the chain, will be displayed on the Command Line. (If you need additional help using RasMol, check out the resources at education.pdb.org/olympiad)

Find the N-terminal end of the protein, and then determine where each alpha helix begins and ends. Do the same for each strand of beta sheet. (You will use this information in step 3) Refer back to the list of features that you want to incorporate into your model that you identified in Step 1. Can you find them and display them in RasMol?

3. Construct a Folding Map of your Model. *This is the key to folding a successful protein model.* Since chain A of the TATA binding protein contains 179 amino acids, and the model is to be built at a scale of 2cm per amino acid, you will need a 356cm mini-toober for this model. In addition to the mini-toober, the kit contains a 356 cm Folding Map. You should first mark the positions on this map of any specific amino acid sidechains (primary structure) that you might want to include in your model, and the position of any alpha helices and beta sheets (secondary structure).

4. Transfer the Information from the Folding Map to the Mini-toober. Once the position of every feature you want to incorporate into your model is indicated on the Folding Map, lay the unfolded mini-toober along side the folding map, and transfer this information onto the toober.

5. Fold the Protein. You are now ready to fold your protein. Using the RasMol image (backbone format) as a guide, shape the toober into the 3D shape of the TATA Binding protein. You may want to use a dowel to form the right-handed alpha helices. The double-ended connectors included in your TATA Binding Protein Folding Kit can be used to stabilize the various strands of the beta sheet.

6. Add Other Features to Your Model. Once you have folded the mini-toober into a 3D shape that represents the TATA Binding Protein backbone structure, you are now ready to add additional features to your model. Remember --- Your model should help to tell the story of what the protein does. Be creative.