

FOLDING OF PROTEIN DOMAINS

BETA SANDWICH/NANOBODY

RCSB PDB-101

pdb101.rcsb.org

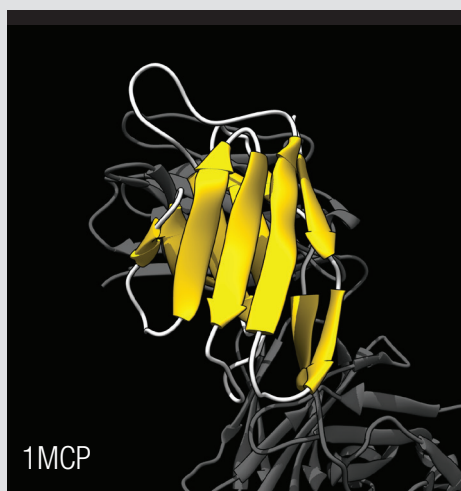
PDB-101 is the Training and Outreach portal of RCSB.org

This fold features two layers of beta sheets.

Many copies of this fold are connected together with flexible linkers to form the distinctive Y-shape of antibodies.

The nanobody in this paper model is similar to a small portion of an antibody.

Explore an example of this domain fold seen in PDB structure **1MCP**.



DOMAIN FOLDING INSTRUCTIONS

STEP 1

Preparing the components

To construct this fold, you will need 9 beta strands (print 1 sheet). Cut them out on the solid black lines.

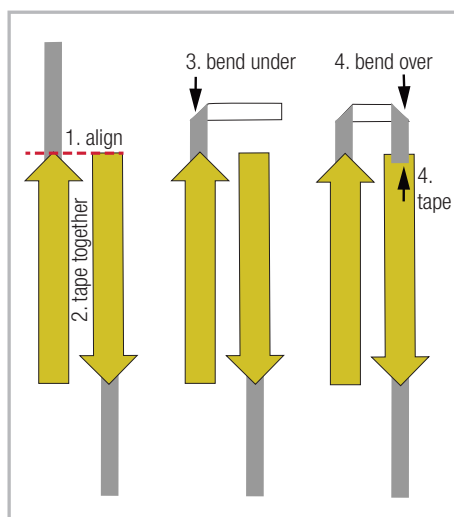


STEP 2

Creating the first beta hairpin

Take one beta strand and orient it arrow-up. Align another beta strand arrow-down (antiparallel) and tape the sides together.

To connect the strands, take the loop from the strand on the left (arrow facing up) and bend it under at 45 degrees at about 1/3 height. Then bend it over, aligning it over the bottom of the arrow on the neighboring beta strand, and then tape.

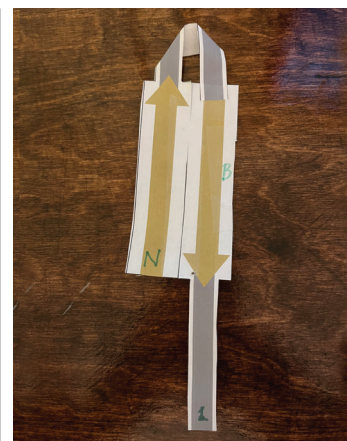
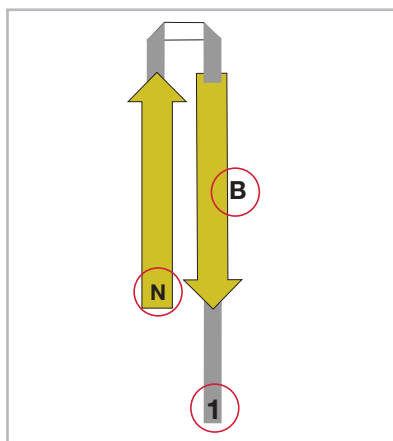


STEP 3

Marking the first hairpin for later folding

Lay the cluster so that the bent loop faces up. Mark N on the bottom of the left arrow for the N-terminus.

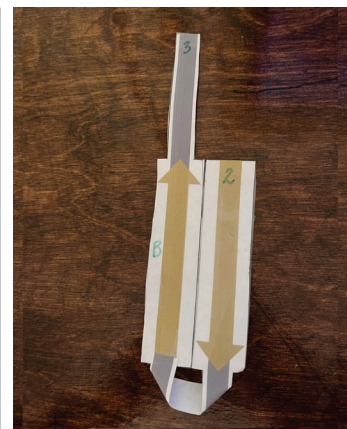
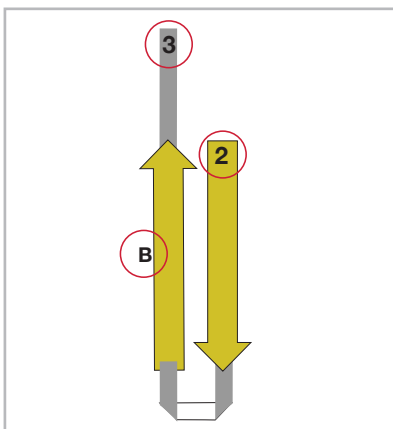
On the neighboring arrow, write 1 on the bottom of the extending loop and B on the right edge in the middle of the right edge.



STEP 4

Creating and marking the second hairpin

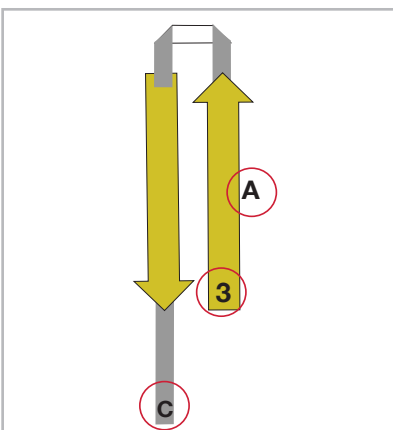
Create another beta hairpin as in step 2. Orient it so that the arrow on the left faces up. Mark 3 on the extending loop on the left, write B on the white area on the left edge of the cluster, and write 2 on the top of the arrow on the right.



STEP 5

Creating and marking the third hairpin

Align 2 beta strands side by side. The strand on the left should be facing arrow down, the strand on the right arrow up and tape together. Take the extending loop on the right and fold it as in step 2 to create the harpin. Then mark C for C-terminus on the bottom of the extending loop on the left, write 3 on the bottom of the arrow on the right, and write A on the right of the right arrow.



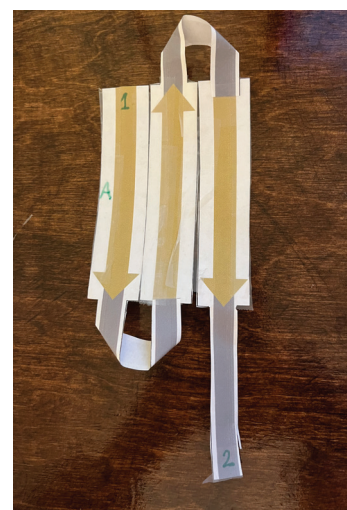
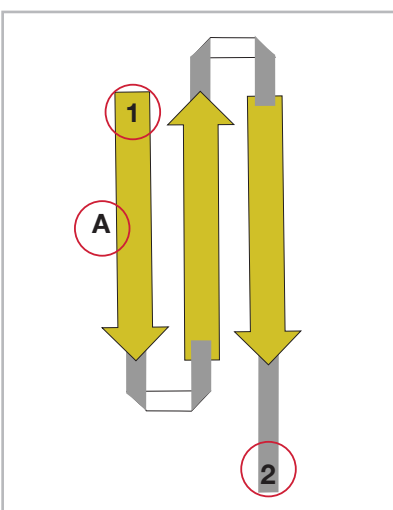
STEP 6

Creating and marking the last beta sheet

Align 3 beta strands side by in the **arrow down | arrow up | arrow down** pattern, starting from the left and tape them together.

Take the extending loop from the middle strand and fold it to the left to create a harpin. Then take the loop from the left most arrow and create the hairpin connecting it with the middle strand.

Mark 1 on the top of the left-most arrow and A on the side. Write 2 on the bottom of the extending loop on the right-most strand.

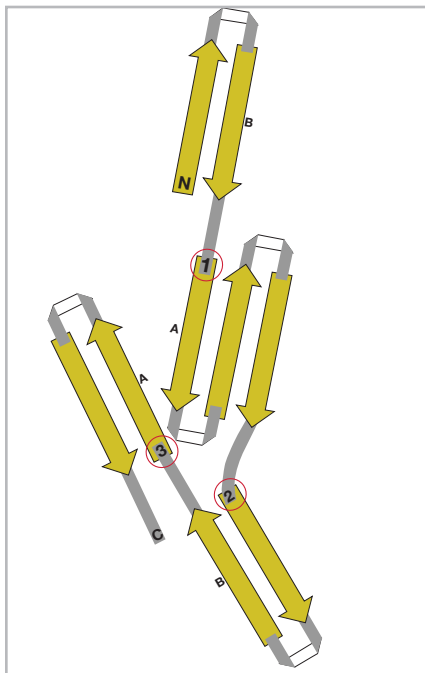


STEP 7

Connecting the clusters

Tape the loop marked 1 on top of the arrow marked 1. Connect 2 and 3 in the same fashion.

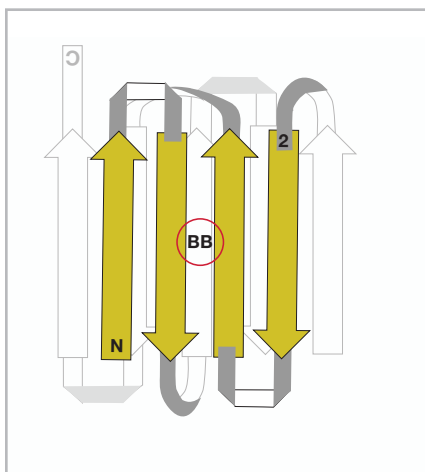
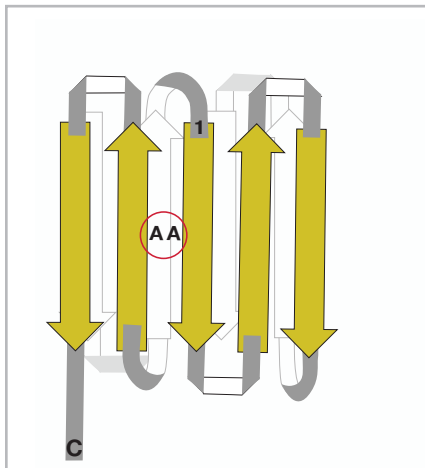
Now you can follow the polymer from the N to the C terminus.



STEP 8

Creating the sandwich fold

Align the sides of the clusters marked A and tape. Then align the sides marked B and tape. Now your beta sandwich is ready!



Visit pdb101.rcsb.org > *Learn* > *Paper Models* > *Creating Paper Models of Protein Domains* to download the template for building this model and to learn more