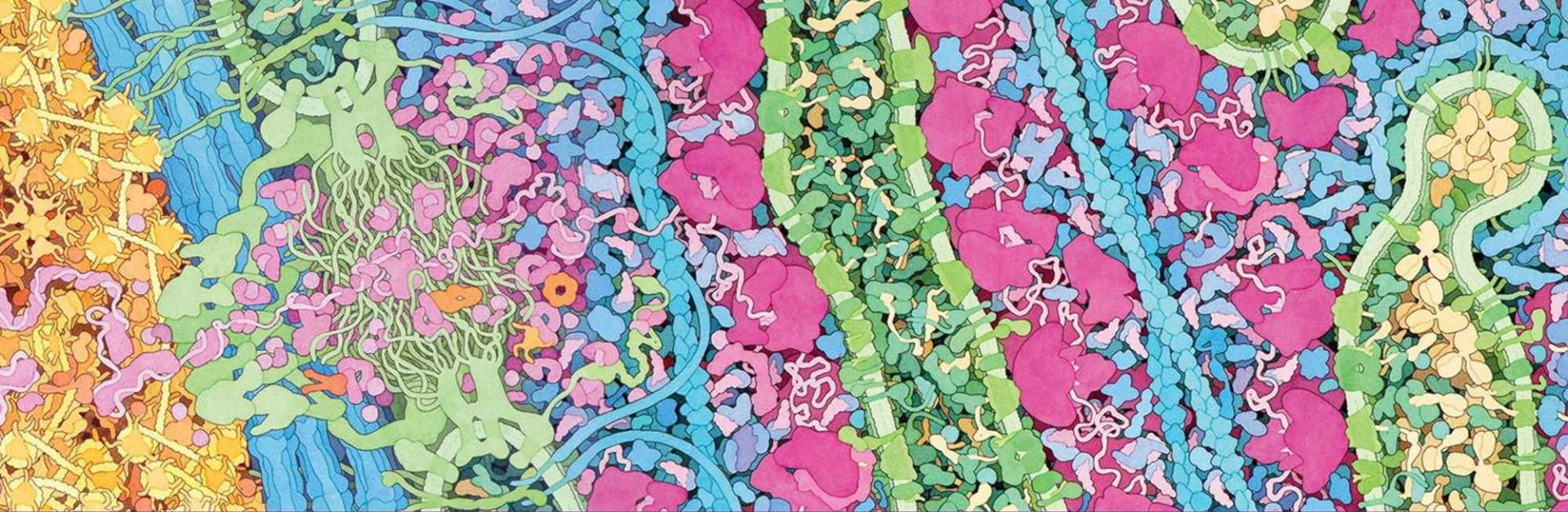




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Transforming Science Learning

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STANYS
SCIENCE TEACHERS ASSOCIATION OF NEW YORK STATE



Building Blocks of Life

Amino Acid Building Blocks + Amino Acid Starter Kit

"Amino acids are as important to life as the letters of the alphabet are to language."

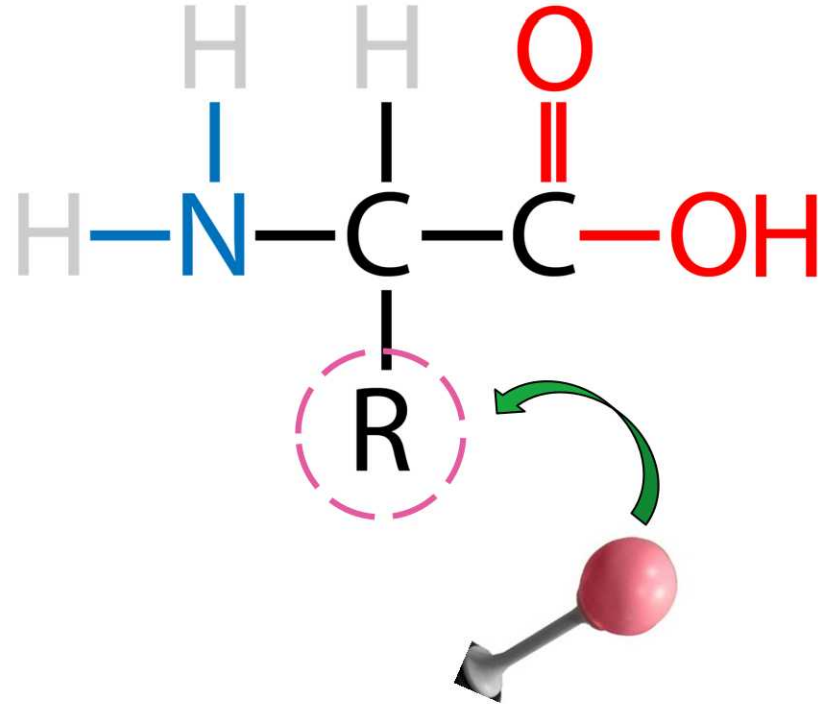
~Anonymous



Molecular Structure of an Amino Acid



- Carbon - Black
- Oxygen - Red
- Hydrogen - White
- Nitrogen - Blue
- Single Bond - *Short* Connector
- Double Bond - *Long* Flexible Connector
- Hydrogens are adjacent

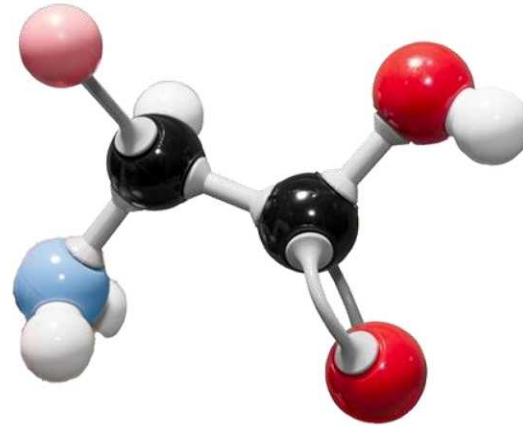
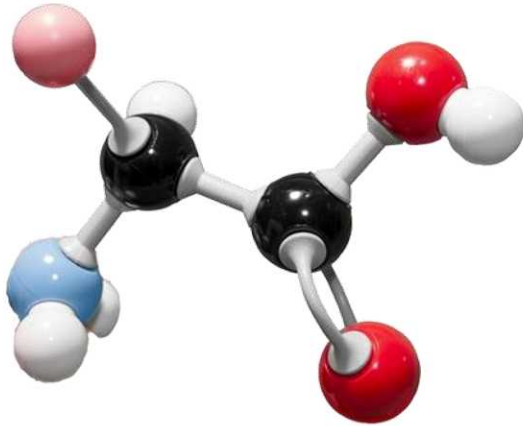


Making a Dipeptide

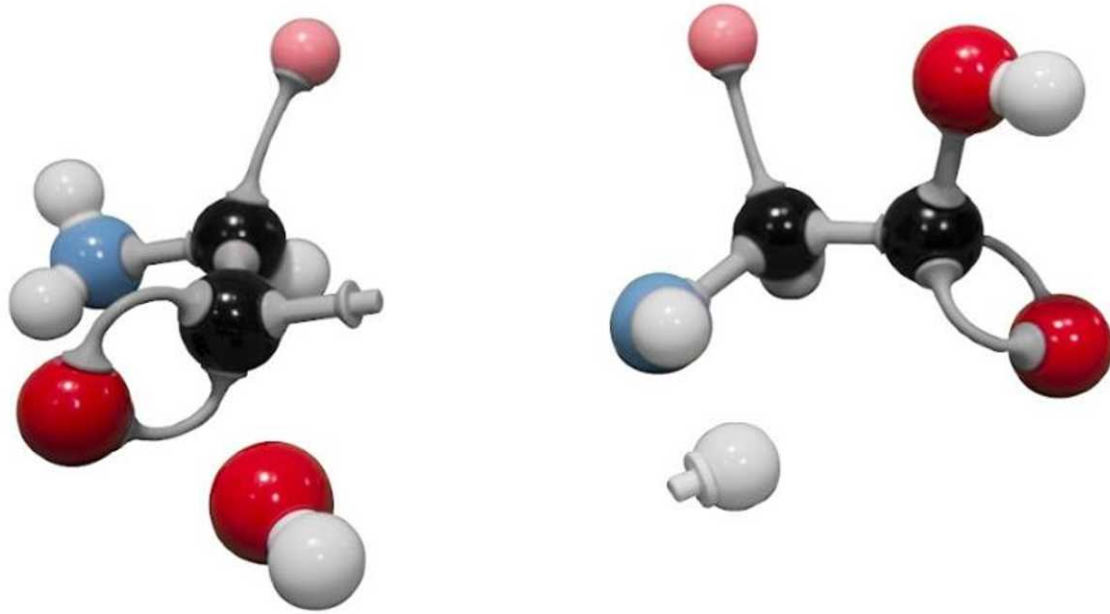
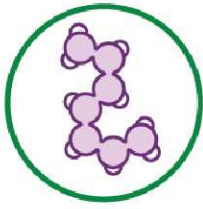


How would you construct a dipeptide?

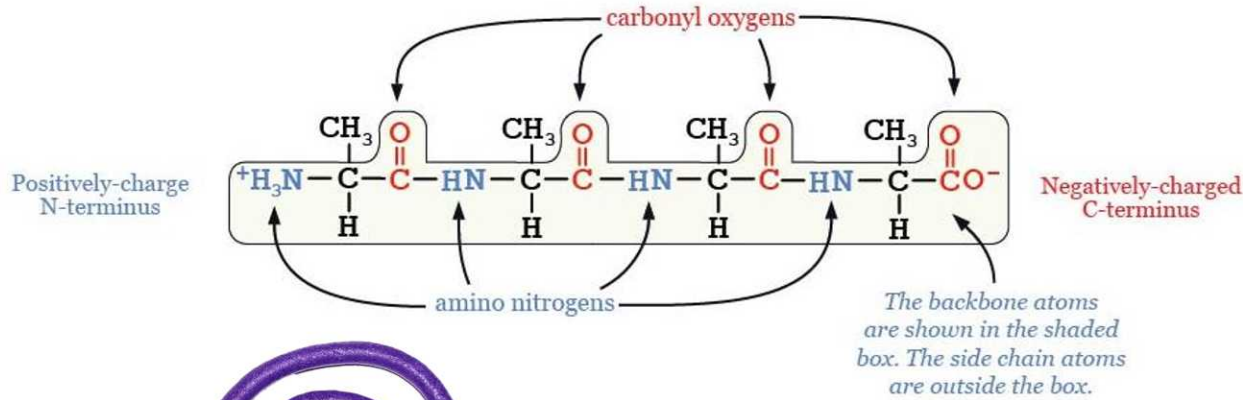
Model this process.



Dehydration Synthesis



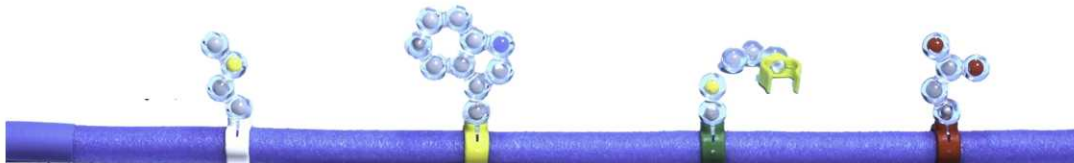
Another Way to Model a Polypeptide



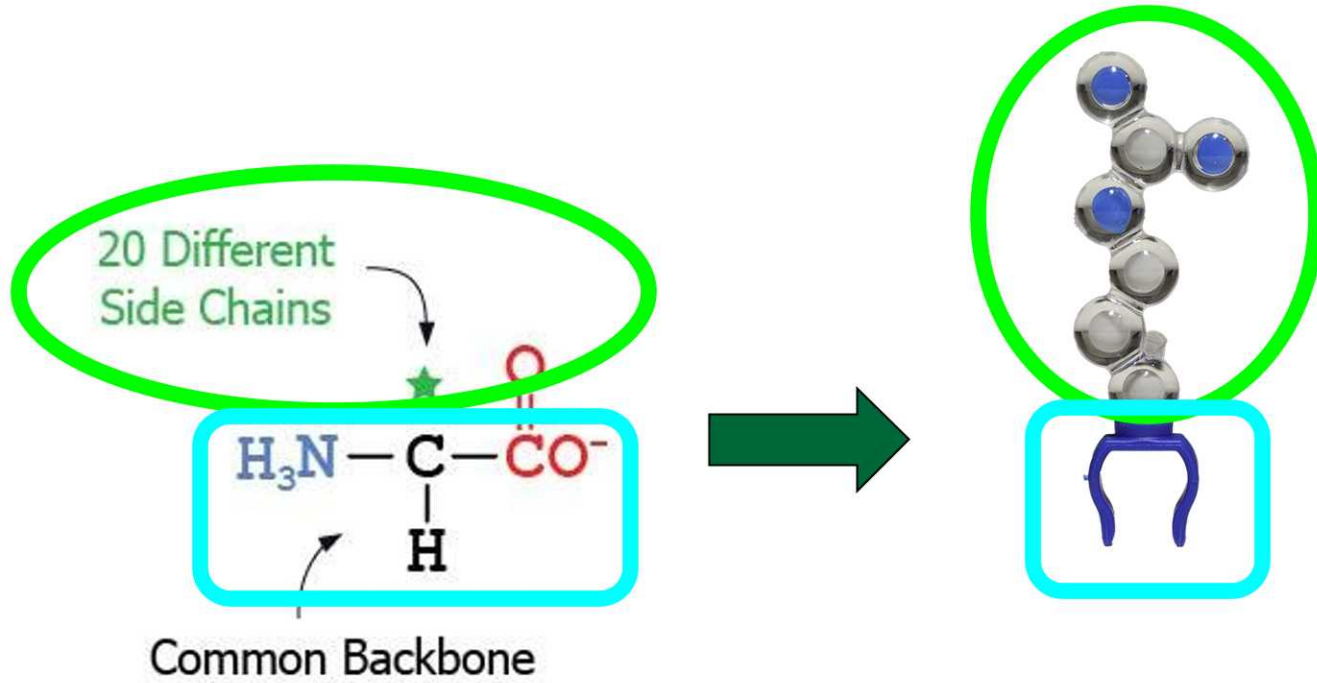
backbone



side chains



Different Representations of Amino Acids



Different Representations of Amino Acids

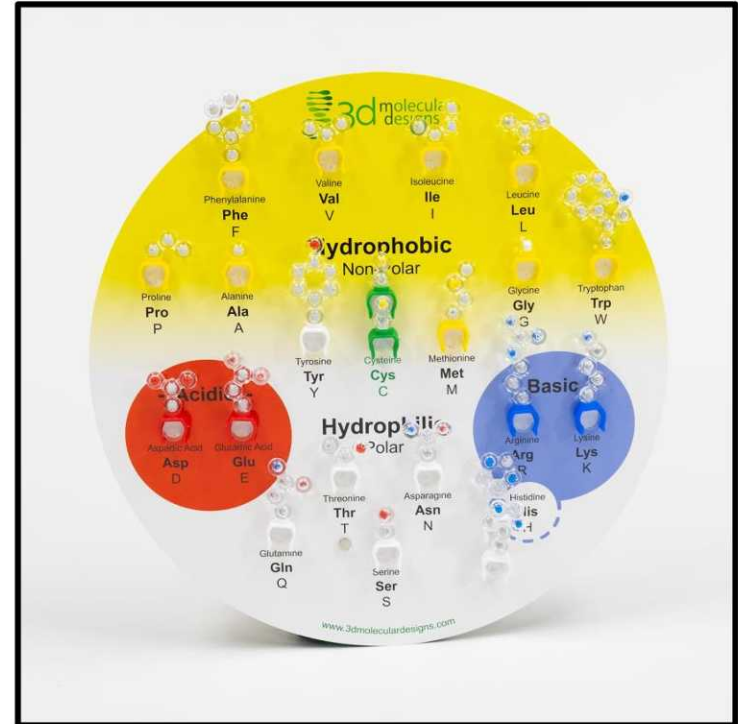


Using the amino acid sidechain chart, **identify** the different types of amino acids and **place** them on the bumpers of circle placemat.

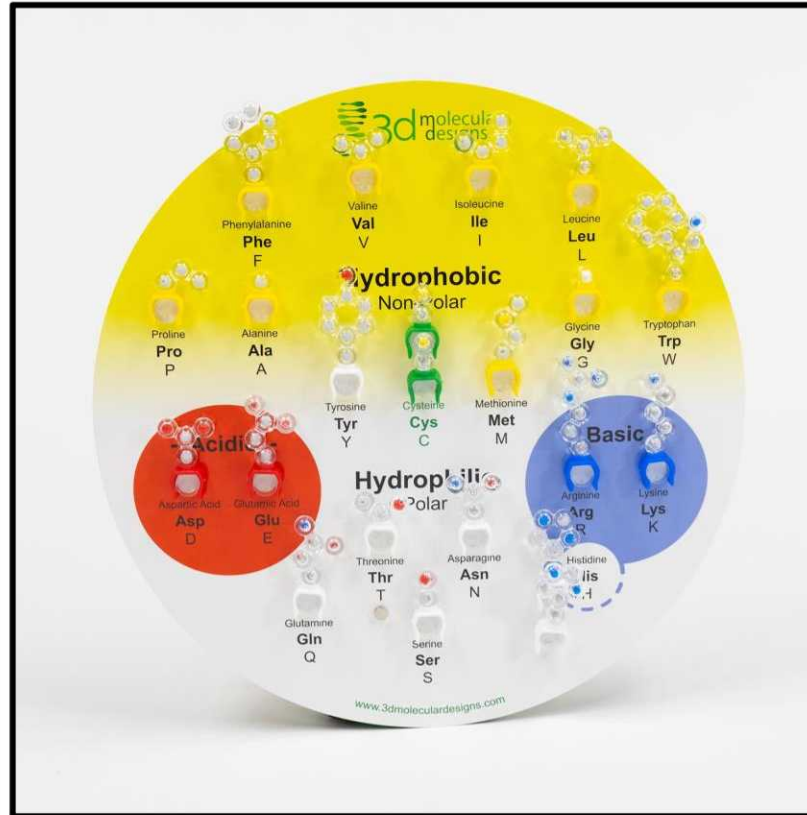
Amino Acid Side Chain Chart

Acidic	Basic	Polar	Non-polar
Aspartic Acid (Asp, D)	Lysine (Lys, K)	Serine (Ser, S)	Alanine (Ala, A)
Glutamic Acid (Glu, E)	Arginine (Arg, R)	Threonine (Thr, T)	Valine (Val, V)
	Histidine (His, H)	Cysteine (Cys, C)	Isoleucine (Ile, I)
		Asparagine (Asn, N)	Leucine (Leu, L)
		Glutamine (Gln, Q)	Tryptophan (Trp, W)
			Glycine (Gly, G)
			Proline (Pro, P)
			Phenylalanine (Phe, F)

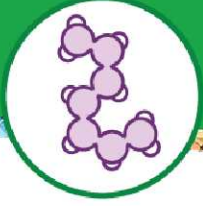
Color Key: Acidic (Red), Basic (Blue), Polar (Green), Non-polar (Yellow)



What do you notice? What do you wonder?



Choose Your Own (Protein) Adventure



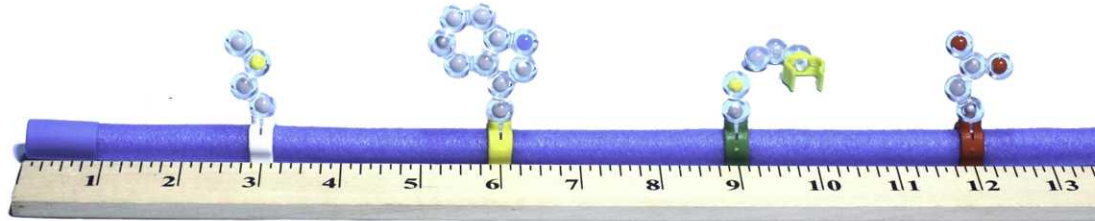
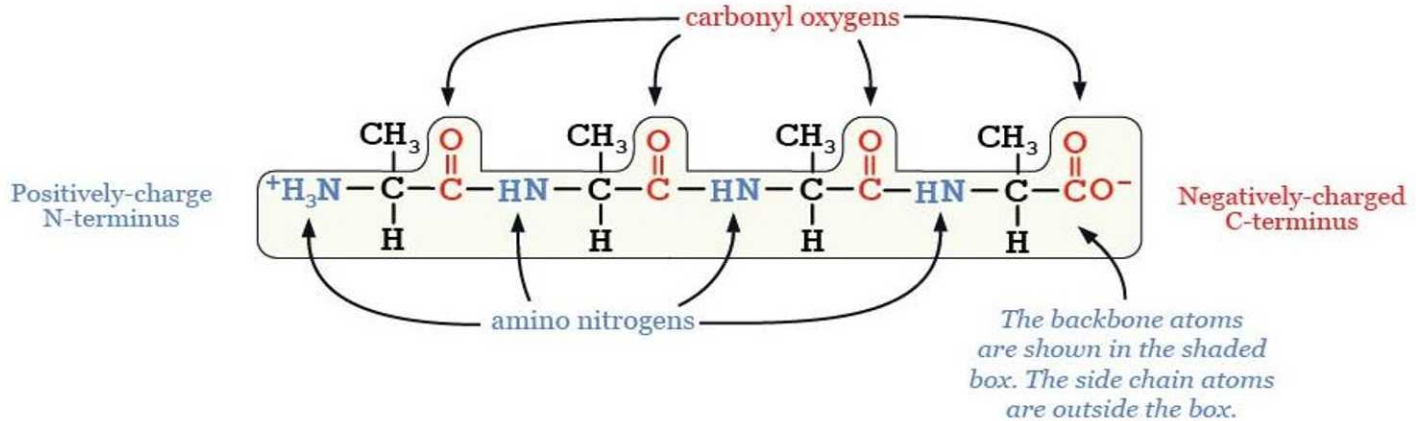
Choose a total of **15 amino acids** with the following chemical properties:



KEY

- 6 Hydrophobic Side Chains are **Yellow**
- 3 Hydrophilic Side Chains are **White**
- 2 Acidic Side Chains are **Red**
- 2 Basic Side Chains are **Blue**
- 2 Cysteine Side Chains are **Green**

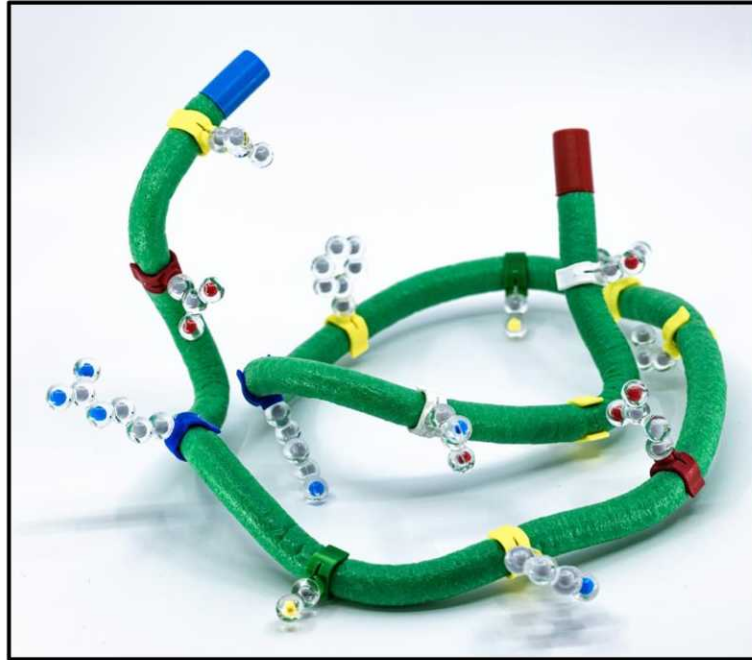
Primary Structure of a Polypeptide



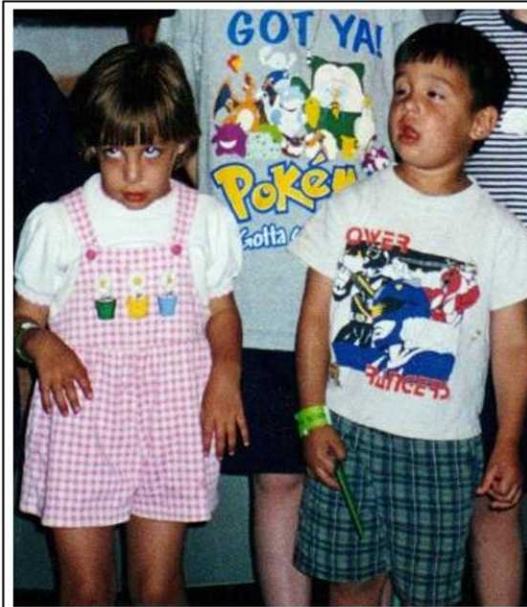
Predict the Effect of Mutations



How might a change in the amino acids affect the tertiary structure of a polypeptide?



Beery Twins



Alexis and Noah Beery as children and teenagers.

Retta Beery

Sepiapterin Reductase

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Jmol User Design Environment (JUDE)
An Online Tool for Creating Protein Visualizations and 3D Printed Models

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Open a New Molecular Structure ✕

A molecular structure file includes the X, Y, and Z coordinates to position each atom in molecule in 3D space. The buttons below will load structure files in the Jmol window to the right.

SMILES sequence

Public PDB file (by ID)

To learn more about SMILES sequences or PDB files, how to find them, and how to load them into the Jmol User Design Environment, visit our [Jmol Training Guide](#).

If your design requires a non-public or custom PDB structure file, we recommend using the local (non-online) Java-based version of Jmol, [available to download here](#). Learn more about using the Java-based version of Jmol with the [Jmol Training Guide](#).

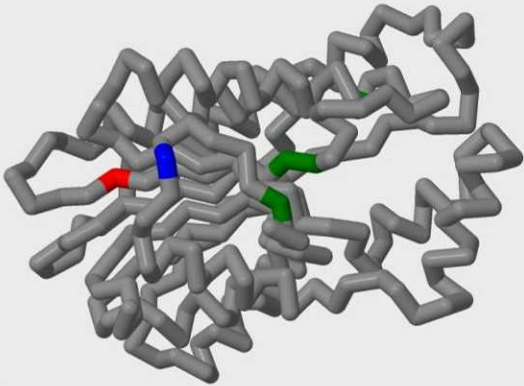
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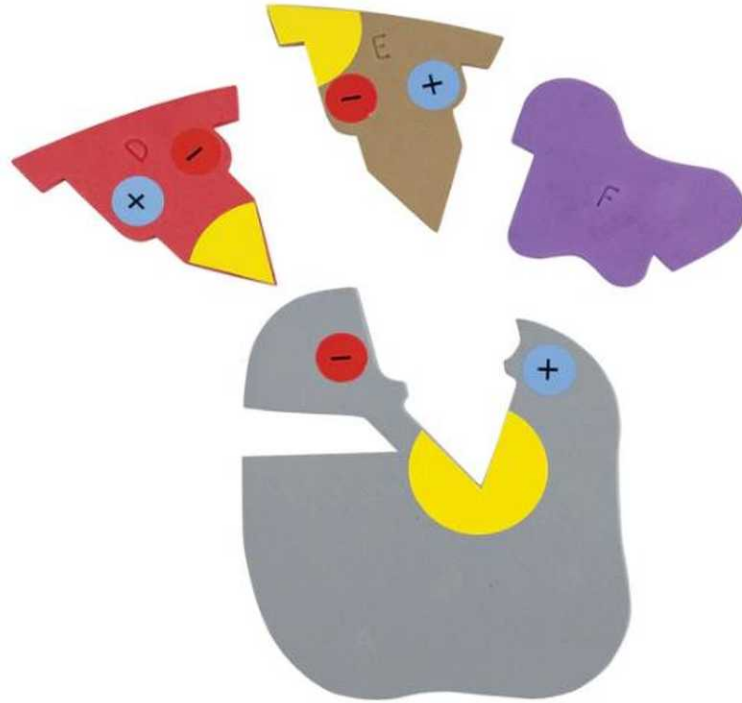
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Enzymes in Action



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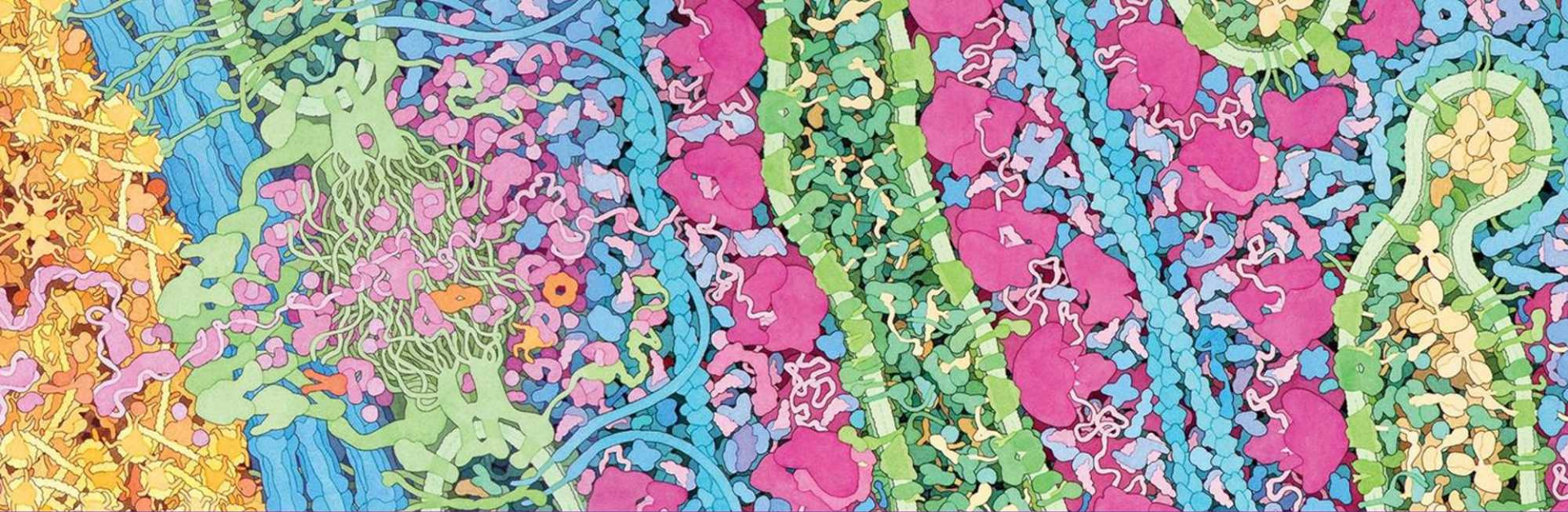
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