Proteins and Enzymes: On the quiz from last week I noticed I got an answer wrong in reference to proteins. The correct answer said that all proteins have a tertiary structure. I thought I heard Prof Merhtens say during lecture that some proteins simply stop at the primary structure. Could someone please clear this concept up for me?

Theoretically a protein could stop at just the amino acid sequence (primary level) and stay linear, but in reality the amino acids in the strand would have a hard time staying linear in a cell due to the lack of space to do so. If it was probable to stay linear and not have tertiary structure, the cell wouldn't need chaperone proteins to stop the amino acids in a protein from interacting with each other and the mainchain atoms. A protein doesn't have to have defined secondary structure (like alpha helices and beta strands), but again most do. Quaternary structure is optional as well because some folded polypeptide chains are functional at the tertiary level. Tertiary structure is the final folded shape for the vast majority of proteins that don't have quaternary structure. The various stabilizing forces make it hard for a protein to NOT form tertiary structure, as described above. Proteins "want" to fold because it is energetically favorable to do so and usually a cell has to use chaperone proteins to prevent protein folding. I like to try to distill things down to the simplest explanation possible for this class, since it is technically a 100-level course. So to make this acceptably oversimplified, the tertiary structure of a protein is its final three dimensional shape, period. And every object has a shape, doesn't it? For most proteins--where the word protein typically refers to a functional polypeptide chain of hundreds or sometimes thousands of amino acids--it will get to that final shape (conformation) by first adopting elements of secondary structure, which then interact with each other and with the random coil regions of the polypeptide into a stable form called the tertiary structure. But now let's look at another example. While we typically are referring to larger proteins when we're having this discussion, some biologically active "proteins" aren't even called proteins, they're called peptides. Vasopressin is a peptide hormone that's only 9 amino acids in length. That's simply not long enough to form beta sheets or alpha helices, so vasopressin does not have any elements of secondary structure. But it still has a three-dimensional shape, of course, which you can see here: http://commons.wikimedia.org/wiki/File:Arginine_vasopressin3d.png So even this peptide hormone, which has none of the stabilizing forces we discussed in class, has tertiary structure, which is why that particular statement was a true statement.

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Author: Brad Mehrtens
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