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Protein sequence and structure: Is one more fundamental than the other?

Jayanth R. Banavar, Trinh X. Hoang, Flavio Seno, Antonio Trovato, Amos Maritan

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We argue that protein native state structures reside in a novel "phase" of matter which confers on proteins their many amazing characteristics. This phase arises from the common features of all globular proteins and is characterized by a sequence-independent free energy landscape with relatively few low energy minima with funnel-like character. The choice of a sequence that fits well into one of these predetermined structures facilitates rapid and cooperative folding. Our model calculations show that this novel phase facilitates the formation of an efficient route for sequence design starting from random peptides.

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