Peptoid Nanosheets Exhibit a New Secondary-Structure Motif

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Peptoids are protein mimics that are relatively resistant to degradation. Just like proteins, these polymers can fold into defined structures through a combination of sequence-dependent interactions. However, the range of possible structures that are accessible to peptoids and other biological mimics is unknown, and our ability to design protein-like architectures from these polymer classes is limited. I will talk about how molecular-dynamics simulations, together with scattering and microscopy data, were used to determine the atomic-resolution structure of the recently discovered peptoid nanosheet, an ordered supramolecular assembly that extends macroscopically in only two dimensions. The simulations revealed a novel secondary structure that is made from not one but two rotational states. This secondary structure opens the door to the design of completely new types of protein-like structures, which may help complement the diverse structures we see in nature.

Ranjan Mannige received his Ph.D. in Mathematical Virology and Computational Chemistry from the Scripps Research Institute under the supervision of Charles L. Brooks III. He then worked on biomolecular origination scenarios at Harvard University with Eugene Shakhnovich, after which he moved to his current postdoctoral position with Stephen Whitelam and Ronald Zuckermann at the Molecular Foundry (Lawrence Berkeley National Laboratory), focusing on computational analysis of peptoid nanosheets. His research interests include protein origination, bioinformatics, virus capsid design criteria, non-equilibrium statistical mechanics, systems biology and macromolecular self-assembly.