Solving Modulated Crystals of Profilin:Actin

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Cellular motility, regulated through cytoplasmic profilin:actin (PA) interactions, is intrinsic to many cellular functions. Profilin both sequesters actin monomers and delivers it to filamentous assemblies. Detailed structural information on monomeric actin in complexes with various actin binding proteins have been provided by X-ray crystallography, but currently no atomic structures for filamentous actin have been determined, although several hypothetical models have been proposed. PA crystals retain the dynamic nature of actin and provide an excellent way to study the protein-protein interactions involved in filament formation. When exposed to conditions known to promote actin filament formation, PA crystals can be transformed into a modulated state characterized by unusual off-lattice satellite reflections. Evidence suggests the presence of a modulated or periodic structure that is occupied by metastable actin filaments. Methods to determine modulated structures are known to "chemical" crystallographers, yet macromolecular crystallographers have, to date, mostly avoided this class of crystal structures. The biological importance of these challenging modulated crystals of PA has prompted the development of methods to solve the underlying atomic structure(s). Progress on this structure determination will be presented.

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