

Investigating the architectural details of enveloped phages by Cryo-electron tomography

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Bacteriophages are the most common biological entities and found in every biosphere, ranging from the human gastrointestinal tract, petrified mummies, to acid-mine drainage. Depending on the nucleic acid composition, capsid symmetry, and presence or absence of a membrane or envelope, bacteriophages can be classified into eleven families[1]. Contrary to mammalian viruses, relatively few bacteriophages have an internal or exterior membrane or lipidic layer[2]. Despite the fact that membrane-containing phages have been discovered for over 50 years, the structural details of the majority of the proteins still remain uncharacterized. How these phage proteins aid in infection cycle inside the host cell, still remains enigmatic. In this study, we elucidated the structural intricacies of membrane-containing phages at unprecedented resolution by combining complementary methods, including biochemistry, super-resolution fluorescence microscopy, and Cryo-electron tomography (Cryo-ET). Using cryo-ET and sub-tomogram averaging, we revealed the structures of nucleocapsid and packaging enzyme.

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