Understanding the infection cycles of membrane-containing phages at molecular resolution

Bacteriophages are the most abundant biological entities in the biosphere. In contrast to mammalian viruses, relatively few bacteriophages possess internal or external membranes. Despite the discovery of these membrane-containing phages over 50 years ago, their infection cycle has remained largely enigmatic.

Here using complementary methods, including biochemistry, super-resolution fluorescence microscopy, and cryo-electron tomography (cryo-ET), we revealed the structural and molecular details of infection cycles of two enveloped phages. We revealed that membrane containing phages undergo striking morphological changes during their attachment to the bacterial hosts and we obtained mechanistic insights into genome packaging and lysis steps. Addtionally, we revealed the role of phage proteins in orchastrating the synthesis of new virions. Our current work offers comprehensive insights into the molecular and mechanistic aspects of the lifecycle of membrane-containing phages, revealing evolutionary connections to eukaryotic viruses.