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**Biophysical Analysis of Virus Particles and their Maturation: Insights into Elegantly Programmed Nanomachines** J.E. Johnson, Dept. of Molecular Biology, The Scripps Research Inst., La Jolla, CA, 92037

Bacteriophages, herpesviruses and other large dsDNA viruses contain powerful molecular machines that pump DNA into preassembled procapsids triggering maturation. This event commences when DNA pressures within the capsid exceed 10-fold that of bottled champagne and are detected by a protein switch that transduces a signal outside of the particle. We investigated two bacteriophage systems to understand the structural basis for these events. The asymmetric structure of the mature P22 bacteriophage was determined to 17Å resolution by cryoEM and image processing, revealing the portal protein implicated in DNA packaging and pressure sensing as well as ordered dsDNA in the vicinity of the portal. Virus particle maturation was studied with the λ-like bacteriophage HK97. Intermediates in the maturation trajectory were characterized by cryoEM, solution x-ray scattering, crystallography and single particle fluorescence, allowing the creation of a movie<sup>[1]</sup> that depicts the particle dynamics.

[1] Wikoff, W., Conway, J., Tang, J., Lee, K., Gan, L., Cheng, N., Duda, R., Hendrix, R., Steven, A., and Johnson, J. 2006. Time-resolved molecular dynamics of HK97 virus maturation interpreted by electron cryo-microscopy and X-ray crystallography. *J Struct Biol* **153**:300-306.