Viruses are fascinating from the biological and physical perspectives alike. The macromolecular inventory of typical viruses usually involves roughly ten distinct macromolecular species (the viral genome and proteins that surround it), and yet, they are capable of a dazzling variety of complex processes within their cellular hosts. The goal of this talk will be to examine the physics behind the life cycles of the beautiful viruses (bacteriophage) that attack bacteria. In particular, I will give an overview of how these viruses get more than 10 microns worth of DNA in and out of their small (50nm) protein capsids. To answer that question will require an examination of both the elasticity and electrostatics of DNA and will culminate in a series of theoretical predictions about how the forces present during DNA packing depend upon key experimental parameters such as DNA length and the salt conditions. I will also describe our recent experiments aimed at testing these predictions in which we examine DNA ejection from viruses one DNA molecule at a time. Rob Phillips, Ph.D., is professor of Engineering and Applied Science at California Institute of Technology in Pasadena. He received his doctorate in Physics in 1989 from Washington University in St. Louis. His laboratory's research projects are aimed at exploring nanoscale mechanics in biological systems. Several recent case studies include mechanical processes such as DNA ejection and DNA packing that occur during the life cycle of bacterial viruses and the study of how certain classes of ion channels are gated by mechanical forces. His extensive work in modeling materials culminated in a book entitled Crystals, Defects and Microstructures. He is also writing a new book Physical Biology of the Cell. Prof. Phillips is a recipient of 2004 NIH Director's Pioneer Award.