The Effect of RNA Secondary Structure on Virus Assembly and Genome Release

Viruses exploit the machinery, raw materials, and energy of their host cells for much of their life cycle, and as such they can be incredibly simple organisms, often consisting of only a genome packed inside a protective protein shell (“the capsid”). In fact, the simplest viruses are comprised of one copy of a single-stranded (ss)RNA genome inside a icosahedrally-symmetric shell composed of many copies of a single capsid protein. Once inside the host cell, the genome of these viruses acts as a messenger RNA and is directly translated by the host cell ribosomal machinery, allowing the viral life cycle to take part entirely in the cytoplasm. Two critical parts of this life cycle involve the disassembly of the virion upon entering the cell, allowing the ribosomes of the host cell to translate the viral genome and make a large number of copies of it and of its protein gene products – the RNA replicase and the capsid protein – and the subsequent assembly of many new virions after viral replication has occurred. My work aims at learning how physical properties of the RNA, in particular its secondary structure, effect both the assembly of viral capsids and the ability of the virus to release its genome in the host cell.

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Tuesday, November 14, 2017
2033 Young Hall
12:00 PM