“RNA Dynamics in and out of Viral Capsids”

Understanding the dynamics of biomolecules in solution is challenging, and to do so in the cellular environment is even more difficult. To get a grasp on how dynamic long RNAs are in cells, simpler cell-free/in vitro systems are currently some of the best ways to probe these properties.

To study such dynamics, we turn to a family of RNA plant viruses, the bromoviruses, which have a long history of study and which offer novel insights into dynamic processes like viral capsid self-assembly and disassembly. We characterize the structure and dynamics of the RNA inside and outside the capsid and how they may lead to a novel mechanism for viral RNA release and delivery to the host cellular machinery. In particular, we hypothesize that it is possible for translation of a messenger-sense viral RNA genome to be initiated while its protective capsid is still intact.

In my talk I describe two experimental approaches to this problem. In the first, we determine the probability that the 5' end of viral RNA fluctuates spontaneously outside the intact capsid, making it available to the ribosomal apparatus. In the second, using single-particle magnetic tweezers in a collaboration with the Bowie lab at UCLA and the ABCD Biophysics group at the Ecole Normale Superieure in Paris, we measure the forces required to pull RNA out of its capsid, as a basis for understanding how RNA dynamics play a role in delivery of the viral genome to its host.

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