Molecular mechanisms of RNA virus replication [1]

First, we examine at a molecular level the mechanisms of virus replication, such as virus protein synthesis, genome replication, and viral particle formation and their interplay with cellular processes.

RNAi and its function as an antiviral defense mechanism [2]

Secondly, we study the host strategies that control virus infection, including innate immune responses, such as RNAi and the mechanisms that the virus has evolved to suppress the host antiviral responses.

Viral-host interaction networks

Using high-throughput experimental and computational approaches, we study the host cell factors that interact with the virus during infection. We aim to create a detailed and comprehensive map and model of viral-host interactions, and to provide fundamental insights into the viral regulation of host circuitry. Understanding the structure and dynamics of these interactions is crucial to developing novel methods to control viral replication.

Recently, we developed a novel statistical genomics approach to study the occurrence and evolution of short host-like peptide motifs in viruses and their role in host-virus interactions.

Click here [3] for more details and for the dataset of motifs in viral proteins.

Virus population dynamics and evolution [4]

Lastly, in a unique combination between experimental and computational techniques, we are developing novel and exciting approaches to study virus population dynamics and evolution at the molecular and genomic level. We aim to elucidate the consequences of these evolutionary strategies for viral pathogenesis and the epidemiology of viral diseases. Understanding the mechanisms of virus evolution is essential to both development of antiviral therapies and vaccine design.

Links
[1] https://andino.ucsf.edu/aim1
[3] https://misc.hpse.ucsf.edu/~tzachi.hagai/viral_elms