

The Li laboratory is working to uncover the molecular mechanisms of two RNA-mediated processes: the CRISPR-Cas (Clustered Regularly Interspaced Short Palindromic Repeats and CRISPR-associated) immunity and ribosome synthesis. The CRISPR-Cas systems confer immunity to bacteria and archaea against invading viruses through several novel enzymatic processes such as RNA-guided DNA or RNA cleavage, RNA-stimulated second messenger synthesis and degradation, and second messenger-stimulated RNA cleavage. Ribosome is the RNA-protein machine that synthesizes proteins in all organisms. The maturation pathway of ribosome is mediated by RNA-guided RNA modification and processing and is thus a target for anticancer drugs. The Li lab uses structural biology (x-ray crystallography and electron cryomicroscopy, or cryoEM), directed protein evolution, yeast genetics, and other biophysical methods to elucidate the chemical basis for these fascinating enzymes and to provide synthetic strategies in development of gene editing, liquid biopsy, virus detection and therapeutic biotechnology.