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Selected Publication

Hyokeun Park, Yulong Li & Richard W. Tsien. Influence of synaptic vesicle position on release probability and exocytotic fusion mode. *Science* 335, 1362-1366 (2012)

Research Aims and Interests

Enormous progress has been made in fluorescence microscopy in last two decades. In particular, recent advances in single-molecule fluorescence microscopy have enabled us to directly observe movements and interactions of individual proteins in real time. Our lab has worked on developing new microscopy techniques and applying them to biological questions. One of our research focuses is investigating single molecules dynamics using single-molecule *fluorescence resonance energy transfer* (FRET). Currently, we are working on mechanisms of histone methylation by single methyltransferases (SET8s). Histone methylation plays an important role in the regulation of gene transcription. That is, histone methylation at some sites works as an activator but methylation at other sites serves as a repressor. The role of histone methylation by SET8 for the gene transcription remains controversial. The mechanism of histone methylation by SET8 has not been clearly understood yet. We are working on how single SET8 molecules transfer methyl group from S-(5'-Adenosyl)-L-methionine chloride (SAM) to H4 (histone 4) using *in vit*ro single-molecule FRET microscopy. We observed the fluorescence resonance energy transfer between single SET8 molecules and single H4 molecules. We are investigating how FRET signals change during the histone methylation process. We are expanding our research to mechanisms of DNA replications using *in vitro* single-molecule FRET microscopy.

In addition, we have built a live cell FRET microscopy setup. We are working on the signaling pathway and dynamics in live cells using this microscopy setup. In particular, we are examining how the endoplasmic reticulum stromal interaction molecule (STIM) interacts Orai under the depletion of internal calcium stores. We are applying our live cell FRET microscopy to other biological questions too.