단일생분자 연구실

Dynamics & Mechanics of Biomolecules (DMB)

Prof. 이종봉

◆ 주 연구분야

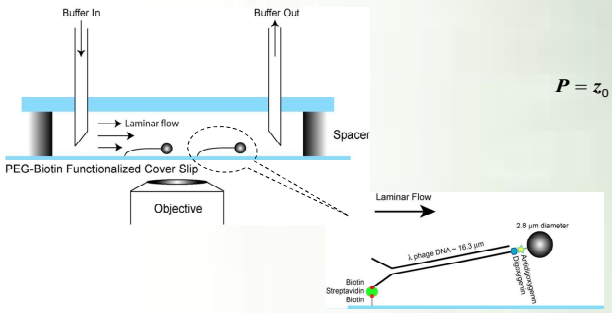
Single-molecule biophysics: **The inherent averaging associated with the conventional biochemical tools makes it difficult to unravel the salient features of biomolecular mechanisms. The single-molecule detections have been opening a new window on the various molecular transactions involved in the biological questions.**

◆ I-BIO 참여 연구분야

- **Dynamics and mechanism of translation initiation with Prof. Sung Ki Jang**
- **DNA mechanics in collaboration with Prof. Wokyung Sung**
- **DNA-Protein and Protein-Protein interactions in DNA repair and replication**
- **Dynamics of membrane proteins**

. Our group utilizes **force spectroscopy**, **a single particle tracking**, **FRET**, or **their combinations** to study the biological questions.

Multiplexed single-molecule assay



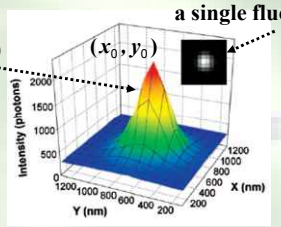
A laminar flow creates a drag force on the bead and stretches the DNA parallel to the surface of the flowcell. Monitoring the position of the bead allows us to measure the length of the DNA.

Single particle tracking

Point Spread Function (PSD)

$$P = z_0 + A\exp\left[-\frac{1}{2}\left[\left(\frac{(x-x_0)}{s_x}\right)^2 + \left(\frac{(y-y_0)}{s_y}\right)^2\right]\right]$$

Diffraction pattern of a single fluorophore



Toprak et al. Annu. Rev. Biophys. Biomol. Struct. (2007)

Uncertainty of the center position

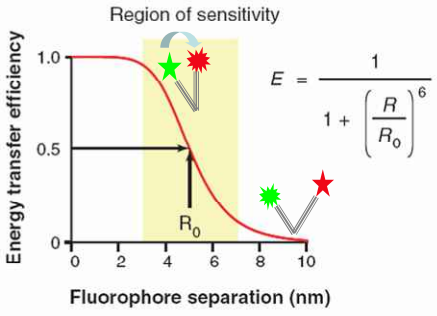
$$\sigma \approx \sqrt{\frac{s^2}{N}}$$

Standard deviation from PSD

A few nanometers accuracy !

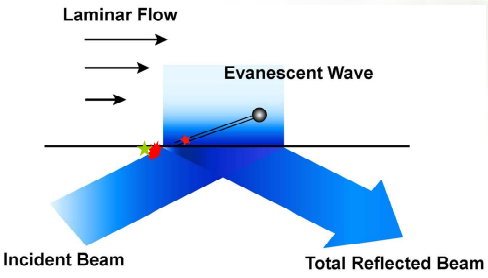
# of photons

Single-molecule FRET



Light excites the donor fluorophore (green). When the acceptor fluorophore (red) is enough close to the donor (< 7nm), the resonant energy transfer occurs and results in generating fluorescence from the acceptor. The energy transfer highly depends on the distance between the donor and the acceptor.

Flow-stretching + FRET



Two Detectors: FRET Signal

Bead (Length change of the template)

Information

연구실 위치 : 물리학과, 공학3동 006(A)

연락처 : phone: 279-2095 (이종봉 교수), email: jblee@postech.ac.kr (이종봉 교수)