QBiC SEMINAR

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Friday, March 2, 2012

4:00 PM　OLABB 3F Conference room

Fluctuation theorem applied to bio-motors

Summary

The fluctuation theorem (FT), which is a recent achievement in non-equilibrium statistical mechanics, has been suggested to be useful for measuring the driving forces of motor proteins [1,2]. As an example, we performed single-molecule experiments on F_1-ATPase, which is a rotary motor protein, in which we measured its rotary torque by taking advantage of FT [3]. FT starts to be practically used in rotary motors [4-6]. As another example, we measured the driving force acting on a mitochondrion transported by linear motor proteins in living cells. We hope that FT, which is a non-destructive force measurement method using fluctuations, will be applied to a wide range of biological systems in future.

[1] Hayashi, Tanigawara & Kishikawa. Mesearments of the driving forces of bio-motors using the fluctuation theorem. *submitted*. [2] Hayashi, Ueno, Iino & Noji. Fluctuation theorem applied to F_1-ATPase. *Phys. Rev. Lett.* 104, 218103 (2010). [3] Hayashi. Fluctuation Theorem applied to Bio-motors (Japanese). *Seibutsu Butsuri*, 51, 188-189 (2011). [4] Usukura, Suzuki, Furuike, Soga, Saita, Hisabori, Kinosita Jr. & Yoshida. Torque generation and utilization in the motor enzyme F_oF_1-ATP synthase: half-torque F_1 with short-sized pushrod helix and reduced ATP synthesis by half-torque F_oF_1. *J. Bio. Chem.* 287 1885-1891 (2012). [5] Tanigawara, Tabata, Ito, Ito, Watanabe, Ueno, Ikeguchi & Noji. The role of the DELSEED loop in torque transmission of F_1-ATPase. *submitted*. [6] Yokoyama, Kishikawa, Hayashi, Esma, Noji & Konno. Origin of rotor domain and torque generation in rotary ATPase. *in preparation.*

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