Meiji University Global COE Program

30th Mathematical Sciences based on Modeling, Analysis and Simulation seminar

Date: October 14, 2010, 16:30～18:00

Location: Meiji Univ. Ikuta Campus, Build 2 Annex A, Room A207

Kumiko Hayashi (Osaka Univ, ISIR)

Title :Fluctuation theorem applied to bio-motors

Abstract :Fluctuation theorem (FT) is the physical law of entropy production caused when an operation is added to a small system, which is sensitive to thermal noise. When applied to a macroscopic system, FT is equivalent to the second law of thermodynamics. Since 1993 when FT was discovered, it has been studied theoretically and experimentally for various physical systems.

In our study, FT was first applied to bio-motors in order to measure their driving forces. For example we applied FT to F1-ATPase, which is a rotary motor protein, and measured its rotary torque by using FT. Being practically useful for rotary motors when our results were compared with those obtained in previous studies, FT has begun to be used for the torque measurements of of F1 mutants and V1 mutants.

Now we try to apply FT to measure driving forces exerted by motor proteins in vivo or in a cell. Concretely we observed mitochondrion transported by motor proteins in the axon of PC12 cells. We would like to discuss whether we can measure the driving force acting on a mitochondria. We will show our primitive data related to this issue.

Reference:

[1] Kumiko Hayashi, Hiroshi Ueno, Ryota Iino and Hiroyuki Noji, Phys. Rev. Lett. 104, 218103 (2010).

Everyone is welcome to attend the MAS seminar.

Meiji institute for Advanced Study of Mathematical Science (http://www.mims.meiji.ac.jp)

(Organizers: M. Mimura, D. Ueyama, Y. Wakano, K. Ikeda and S.Kinoshita)

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Access: 10 minutes on foot from Ikuta St. Odakyu line,
Or 10 minutes by bus No. 13「明治大学正門前」, get off at the last stop.
See http://www.meiji.ac.jp/koho/campus_guide/ for details.