Meiji University Global COE Program
31th Mathematical Sciences based on Modeling, Analysis and Simulation seminar

Date : November 15, 2010, 16:20〜17:20

Location : Meiji Univ. Ikuta Campus, Build 2 Annex A, Room A310

Akinori Awazu (Hiroshima Univ.)

Title : Molecular number smallness induced slow nonstationary fluctuations in catalytic reaction networks

Abstract : Slow fluctuations around equilibrium and self-organized critical behavior under nonequilibrium conditions of catalytic reaction networks induced by smallness in the molecule number were investigated.

Most intra-cellular reactions progress with the aid of catalysts (proteins), and all catalysts have to be synthesized as a result of such catalytic reactions. Thus, studies in catalytic reaction networks have gathered much attention, in order to develop a theory of the origin of life, as well as to unveil universal statistical characteristics in the present cells. Cells generally consist of a large number of chemical specie, and some chemical species play an important role even at extremely low concentrations amounting to only a few molecules per cell. Then, the fluctuation and discreteness in the molecule number are not negligible.

In our presentation, in order to study the general features of the reaction dynamics in living systems, we focus on the following slow nonstationary dynamics of the catalytic reaction networks, which appear when the molecule number is smaller than the characteristic values; I) The slowing down of the relaxation of the fluctuations around equilibrium where the relaxation time is prolonged compared to that of the case of infinite number of molecules [1], and II) self-organized critical behavior induced by the molecule number discreteness under a flow of chemicals [2].

References
[1] A. Awazu and K. Kaneko. Phys. Rev. E 81, 051920, (2010) .
[2] A. Awazu and K. Kaneko. Phys. Rev. E 80, 010902(R), (2009).

Everyone is welcome to attend the MAS seminar.

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.