



# Meiji University Global COE Program 51<sup>th</sup> Mathematical Sciences based on



## Modeling, Analysis and Simulation seminar

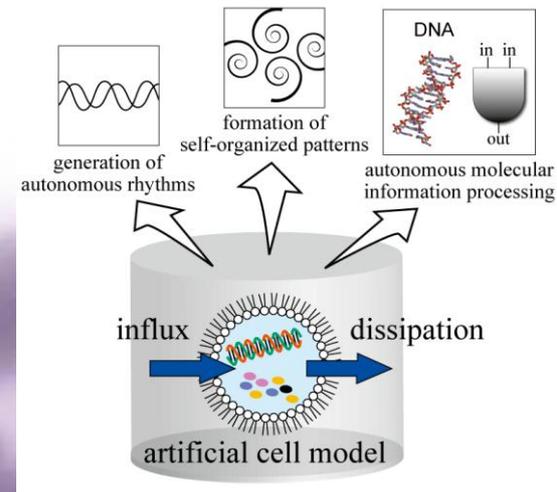
Date: March 22, 2012, 16:30~18:00

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

**Masahiro Takinoue** (Tokyo Institute of Technology)

Title : Challenges to the construction of artificial cell models  
as micrometer-scaled nonequilibrium dynamic systems

Abstract : Understanding the essence of life systems is one of the most important issues in science. Although our understanding of the molecular basis of life systems has dramatically increased, the whole picture of life systems as autonomous integrated molecular systems has not been revealed yet. Recently, artificial cell systems as simplified models of natural living cells have been proposed. The artificial cell systems have helped us to characterize life systems as autonomous integrated molecular systems [1]. However, most of proposed artificial cell systems have limitations caused by the difficulty in controlling nonequilibrium conditions in cell-sized systems. It is required to develop experimental methods to control nonequilibrium conditions in cell-sized systems by realizing sustained matter and energy flows into/out of cell-sized systems. In this presentation, we introduce some challenges to the construction of artificial cell models as micrometer-scaled nonequilibrium dynamic systems: (i) a novel method for artificial cell study based on picoliter-sized (cell-sized) water-in-oil (W/O) microdroplets, named Cell-sized continuous-flow stirred-tank reactor ("Cell-sized CSTR"), which realizes nonequilibrium chemically open systems for artificial cell models [2]; (ii) aspontaneous limit cycle rotary motion of micrometer-sized objects in a stationary electric field [3]; (iii) autonomous DNA/RNA molecular computing systems [4]. We believe that these challenges will promote the construction of nonequilibrium artificial cells in future.



- [1] (review) M. Takinoue et al., *Anal. Bioanal. Chem.* 400, 1705-1716 (2011).
- [2] M. Takinoue et al., *Small* 6, 2374-2377 (2010).
- [3] M. Takinoue et al., *Appl. Phys. Lett.* 96, 104105 (2010).
- [4] M. Takinoue et al., *Phys. Rev. E* 78, 041921 (2008).

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/](http://www.meiji.ac.jp/koho/campus_guide/) for details.