



Meiji University Global COE Program

48th Mathematical Sciences based on



Modeling, Analysis and Simulation seminar

Date: December 8, 2011, 15:30~16:50

Location: Meiji Univ. Ikuta Campus, Main. Building, Room 0301.

Shuji Ishihara (The University of Tokyo)

Title : Mechanical control of hexagonal cell packing in *Drosophila* wing.

Abstract: How do mechanical forces control a series of deformations during morphogenesis? Recent studies have revealed that the biased activity and/or localization of force-generating molecules within a cell coordinates the geometrical changes of cells. On the other hand, it remains unclear how the mechanical interaction among cells and the resulting stress field of a tissue are organized to control cellular pattern formation. One of the difficulties comes from the lack of proper experimental methods to directly measure and quantify the forces in the cell population inside the animal body. By adopting Bayesian scheme, we developed a theoretical framework to estimate the pressure of individual cells and the tension of each cell adhesion surface. Responses to laser cutting and myosin distribution agreed with the estimated tensions. Using our method, we studied mechanical basis of hexagonal packing, the increase of hexagonal cells in the *Drosophila* wing during the pupal stage. Our quantification of developmental changes of the stress distribution within a tissue and of corresponding rearrangements of cells provides a new physical mechanism for cell packing: biased external forces acting on the tissue provide the directional information for local orientation of hexagonal cells which underlies the global hexagonalization. Our force estimation method will become a powerful tool in analyzing how information for orchestrating cellular behaviors during morphogenesis is encoded in distributions of forces within a tissue.

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.