

**MIMS/CIMAA Seminar  
on  
Self-Organization**

**第2回 自己組織化セミナー**

2013年7月19日(金) 17:00~18:00

明治大学中野キャンパス 6階 研究セミナー室 3

**Modelling and simulation of biological  
pattern formation on evolving surfaces**

Dr. Chandrasekhar Venkataraman (The University of Sussex)

We investigate models for biological pattern formation via reaction-diffusion systems posed on evolving surfaces. The nonlinear reaction kinetics inherent in the models and the evolution of the surface mean that analytical solutions are generally unavailable and numerical simulations are necessary. In the first part of the talk, we examine the feasibility of reaction-diffusion systems to model the process of parr mark pattern formation on the skin surface of the Amago trout. We present a Lagrangian finite element method to simulate a reaction-diffusion system on growing surfaces of differing mean curvature and we show that the geometry of the surface, specifically the surface curvature, plays a central role in the patterns generated by a reaction-diffusion mechanism. We conclude that the curvilinear geometry that characterizes fish skin should be taken into account in future modelling endeavours. In the second part of the talk, we propose a framework to model and simulate cell motility. The cell membrane dynamics is governed by a geometric evolution law accounting for its mechanical properties. For the polarisation of the cell we postulate a reaction-diffusion system for species located on the moving cell membrane. Protrusion is then achieved by back-coupling these surface quantities to the geometric equation for the membrane position. The numerical method to approximate the general model is based on surface finite elements for both the geometric equation and the surface equations. We demonstrate the versatility of this approach to describe different types of motion such as pseudopod driven chemotaxis as, for instance, featured by neutrophil cells, and the persistent motion of fish epithelial keratocytes.

参加自由です。皆様のお越しをお待ちしております。

・中野キャンパスへのアクセス

JR中央線快速・総武線、東京メトロ東西線／中野駅 下車 北口より徒歩約8分

詳しくは、[http://www.meiji.ac.jp/koho/campus\\_guide/nakano/access.html](http://www.meiji.ac.jp/koho/campus_guide/nakano/access.html)

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