第１１回　流体科学におけるバイオ・医療に関する講演会

主催：東北大学流体科学研究所ライフサイエンスクラスター
共催：日本機械学会バイオエンジニアリング部門　制御と情報－生体への応用研究会, JMS

日時：平成 26 年 6 月 17 日（火）16:00～17:40
場所：東北大学　流体科学研究所　2 号館大講義室（東）
講演内容：

16:00～16:50　Jean-Paul Rieu (Professor, Institute of Light and Matter, Universite Claude Bernard Lyon 1, France/Visiting professor, Institute of Fluid Science, Tohoku University)

“Traction forces exerted by migrating amoebas”

Cell movements and migration are of critical importance in many biological processes (development of the embryo, wound healing, cancer migration, immune systems). Amoebas are a type of protozoa (one-celled animal) that can move or change its shape quickly by extending projections of its cytoplasm due to acto-myosin contractions. This amoeboid type of motion is conserved in eukaryotic cells of higher organisms such as immune cells and metastatic cells. Here, I will present a biophysical analysis of amoeboid migration (shape, velocity and traction forces) on Dictyostelium discoideum and Physarum polycephalum. The traction forces exerted on elastic substrates are measured using traction force microscopy that will be especially detailed during this seminar.

16:50～17:40　Joerg Bernsdorf（Senior Scientist, German Research School for Simulation Sciences GmbH, Germany）

“Multi-Scale Simulation in Medical Physics”

Biological processes in the human body typically occur on a variety of time- and length scales, from below seconds to decades (neuronal activities to the human life-span) and from below millimeters to meters (molecular to human size). The numerical simulation of such processes requires a radically different approach compared to the classical coupled simulation of complex processes.

Over the past decade a new paradigm called “multi-scale simulation” emerged, which successfully contributed to modeling complex biological processes such as aneurysm rupture risk assessment, in-stent re-stenosis or the simulation of early stage aneurysm growth. The basic idea behind the multi-scale approach consists of identifying those core

processes which are well separated in space and time, for conducting a simulation coupling all components acting within their own temporal and spatial range.

In spite of promising preliminary results, a variety of issues related to multi-scale simulation remain yet unresolved. These range form computer-science related problems such as load balancing of complex heterogeneous cross-platform simulations until political aspects like providing high-priority slots on supercomputing installations.

This presentation will give an introduction to the filed of multi-scale simulation illustrated by a variety of applications from the field of Medical Physics. In the second part computer-science related issues such as proper load-balancing and certain political and administrative questions will be addressed.

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