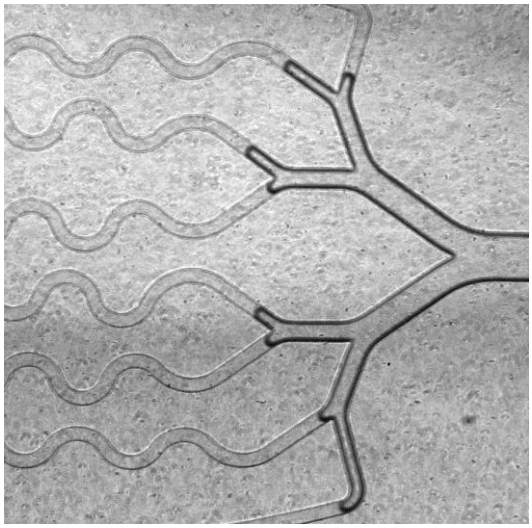
OIST SEMINAR

Date: March 14th, 2017 (Tue)
Time: 3:00 pm – 4:00 pm
Venue: C015 (Lab1, Level C)
Speaker: Prof. Eiichiro Yamaguchi (Tulane University, USA)

Micro-size multiphase fluid dynamics in the human lung:

Airway reopening strategies and roles of pulmonary surfactant



Abstract:

In a healthy lung a viscous fluid-lining layer containing pulmonary surfactant protects and stabilizes pulmonary airways and alveoli by dynamically reducing the surface tension. Severe pulmonary edema (flooding of the airspaces) causes inactivation of the surfactant layer due to the infiltration of plasma proteins that competitively adsorb to the air-liquid interface. In extreme cases, such as the acute respiratory distress syndrome (ARDS) and the acute lung injury (ALI), surface-tension-induced fluid instabilities lead to a collapse of the respiratory airway. For such cases, surfactant replacement therapies (SRT) have generally not been clinically successful, and mechanical ventilation is a "double-edged sword" due to the difficulties regarding homogeneous inflation of collapsed lung through multi-generational branches of respiratory system.

I will introduce recent experimental results of multiphase flow pattern analysis of respiratory airway closure and re-opening process. Our focus is on the role of pulmonary surfactant in homogeneous reopening of multi-generational airway network, and on the visualization of fluid flow surrounding penetrating finger of air to liquid occluded capillary. This project is a part of a larger program aimed at developing safer mechanical ventilation strategies and at providing guidance towards improved ventilation approaches that can reduce ventilation induced lung injury (VILI).

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