Institut d'Alembert Seminar /27th November 2024 at 11:00 am
Amphi Gilbert Simondon – Bât. Sud-Ouest - 1 B36

Microfluidics Approach for Construction of Cell-Mimetic Systems

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Presentation :

Living matter is made up of soft materials. Especially a cell, often coined as a basic unit of life, is a complex and heterogeneous mixture of polymers with a certain extent of order and hierarchy. In 2012, the author and colleagues showed that a giant unilamellar vesicle (GUV), an artificial mimic of a cell membrane, could spontaneously deform and divide without any genetic control (Terasawa et al., *PNAS*, 2012). This finding strengthened the belief that an essential function of cells could be accomplished by simple physico-chemical effects in the community of artificial cell studies. Since then, we investigated the mechanical characteristics and behaviours of GUVs to explore the variety of shapes (Okano et al., *ACS Synth. Biol.*, 2018, Koseki et al., *Langmuir*, 2020). We have also been investigating the characteristics of GUVs as a fundamental platform of cell-mimetic bioreactors (Tsugane et al., *Sci. Rep*., 2018, Katsuta et al., *Langmuir*, 2019). Recently, we succeeded in establishing a facile and reproducible GUV production method to accelerate artificial cell studies in a quantitative manner (Ushiyama et al., *Sens. Act. B: Chemical*, 2021).
Since the lipid bilayer is extremely thin (~ 5nm thick), soft, and fragile, it has been extremely difficult to produce uniform GUVs in a controlled manner. Conventional production methods of GUVs using bulky protocols only generates GUVs with heterogeneous size and structures. Recently, GUV production methods based on microfluidic technology has developed rapidly. Our technology contributed a part in this direction, providing a facile and reproducible results. This trend will help the community to advance the use of GUVs as a cell-mimetic container to recapitulate biological phenomena in a bottom-up manner. In this seminar, I will share our recent progress for standardizing the artificial cell production (Ushiyama & Nanjo et al., *ACS Synth. Biol.*, 2023) and for producing hierarchical artificial cell models.

Biography :

Hiroaki Suzuki is currently a professor in the department of precision mechanics, faculty of science and engineering in Chuo University, Japan. He received M.S. and Ph.D. degrees in Mechanical Engineering from the University of Tokyo, Japan. From 2003 to 2007, he served as an Assistant Professor in the Institute of Industrial Science (IIS), the University of Tokyo, and from 2007 to 2013 as an Associate Professor in the Graduate School of Information Science and Technology (IST), Osaka University. He became an Associate Professor in the Department of Precision Mechanics, Chuo University, Japan in 2013, and promoted to Professor in 2016. His research interests are micro self-assembly, microfluidics, biochips, and artificial cells.

10h40 : Welcome coffee – 1E29
11h : Talk by Hiroaki Suzuki – 1B36