

MOFs, microfluidics and micro-organisms

a crash course in complex variable techniques
for Stokes flow modelling

Date : **October 13 - 23, 2015**

Tuesday, October 13
Friday, October 16
Tuesday, October 20
Friday, October 23

Time : **15:00 - 18:00**

Venue : **127 Conference Room**
Faculty of Science Bldg. #3
Kyoto University



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This lecture course will introduce how to use the mathematics of complex analysis to study a variety of technologically important problems of slow viscous flows ("Stokes flows"). Such complex variable techniques are rarely used in the study of low-Reynolds-number hydrodynamics even though the methods are versatile and powerful and, moreover, are increasingly relevant in a variety of new technological applications in nano- and micro-fluidics, colloid science and biomechanics.

The lectures will be of interest to students wishing to acquire a novel armoury of skills to tackle real problems in applications, and to those seeking simply to learn new techniques in complex variable methods. As examples, we will show how the techniques can be applied to:

- the fabrication of microstructured optical fibres ("MOFs")
- superhydrophobic surfaces
- the locomotion of microorganisms and low-Reynolds-number swimmers.

Principal topics: Stokes equations; reversibility and the "scallop theorem"; fundamental singularities of Stokes flows (stokeslets, stresslets, rotlets); the Lorentz reciprocal theorem; Goursat representation of biharmonic fields in terms of analytic functions; conformal mapping; free boundary problems; mixed boundary value problems; transform techniques; boundary integral methods.

❖ 本講義はSGU数学特別講義(数理流体力学)として大学院の学生には1単位認定されます。



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