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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

**Vesicle dynamics and electrohydrodynamics: modeling
and simulations**

by

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Abstract

In this lecture, we shall introduce the governing equations and numerical methods for the vesicle problem. A vesicle is a liquid droplet with radius about 10 microns enclosed by about 6 nm phospholipid membrane suspended in an incompressible fluid. A vesicle membrane surface is known to be incompressible and exhibits bending resistance. Instead of keeping the vesicle locally incompressible, we introduce a modified elastic tension energy to make the vesicle surface patch nearly incompressible so that solving the unknown tension (Lagrange multiplier for the incompressible constraint) can be avoided. Nevertheless, the new elastic force derived from the modified tension energy has exactly the same mathematical form as the original one except the different definitions of tension. The vesicle surface is discretized on a triangular mesh where the elastic tension and bending force are calculated on each vertex of the triangulation. A series of numerical tests on the present scheme are conducted to illustrate the robustness and applicability of the method. In addition, we extend the method to study the vesicle electrohydrodynamics by coupling both the immersed boundary and immersed interface method. We shall study the effects of vesicle dynamics under electric field.

Date: ***Thursday, 31 Aug 2017***

Time: ***4:30p.m. – 6:00p.m.***

Venue: ***Room 1505, Academic Building***
(near Lifts 25 & 26), HKUST

All are welcome!