# Special Program in Applied Mathematics and Applied Mechanics

*An Immersed Boundary Method for Endocytosis*

2015 - 04 - 29 (Wed.)
15:00 - 18:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

Endocytosis is one of the cellular functions for capturing (engulfing) vesicles or microorganisms. Understanding the biophysical mechanisms of this cellular process is essential from a bioengineering point of view since it will provide guidance for developing effective targeted drug delivery therapies. In this talk, we propose an immersed boundary (IB) method that can be used to simulate the dynamical process of this important biological function. In our model, membranes of the vesicle and the cell are treated as Canham-Helfrich Hamiltonian interfaces. The membrane-bound molecules are modelled as insoluble surfactants such that the molecules after binding are regarded as a product of a “chemical” reaction. Our numerical examples show that the immersed boundary method is a useful simulation tool for studying endocytosis, where the roles of interfacial energy, fluid flow and viscous dissipation in the success of the endocytosis process can be investigated in detail. A distinct feature of our IB method is the treatment of the two binding membranes that is different from the merging of fluid-fluid interfaces. Another important feature of our method is the strict conservation of membrane-borne receptors and ligands, which is important for predicting the dynamics of the endocytosis process.