Palestra

22.10.2013

Two mechanisms of pattern formation in models of the interior of living cells

Prof. Sergio Alonso

PTB Berlim
Physikalische Technische Bundesanstalt
Alemanha

Data: Terça-feira, 22 de Outubro de 2013
Horário: 14h00
Local: Anfiteatro 3, Faculdade de Engenharia
Prédio Eng. Itamar Franco

Resumo

Multitude of biochemical reactions happen simultaneously inside living cells. Depending on the necessity of the cell, it activate or inhibit such reactions by chemical signals or it can also regulate them by spatial or mechanical constrains. These control processes may produce the formation of static or dynamic spatio-temporal distributions of chemical substances inside the cell, giving rise to pattern formation. I show two mechanisms of pattern formation inside cells and I discuss their application to different biologically relevant problems:

1) Phosphorylation and dephosphorylation of proteins are processes of activation and deactivation which regulate many cell reactions. When these processes are assumed to occur in a well-mixed environment inside the cell, the classical Goldbeter-Koshland model of protein phosphorylation and dephosphorylation precludes the formation of stable inhomogeneous states. The introduction of spatially localized enzymatic action at the cellular membrane produces the spontaneous formation of domains of phosphorylated proteins.

2) Biochemical substances regulate active stresses by the activation or inhibition of molecular motors in the cytoskeleton. Deformations in the cytoskeleton drive the displacement of the fluid part of the cytoplasm, which drags the biochemical substances. Both parts of the cytoplasm: viscoelastic cytoskeleton and viscous cytosol, are modeled as a poroelastic medium, which may produce different forms of mechano-chemical waves, including traveling, standing and rotating waves.

Informações

Secretaria da pós-graduação
Campus Universitário - Bairro Martelos
Juiz de Fora – MG - 36036-330
Tel: (32) 2102-3481

Programa de Pós-Graduação em
Modelagem Computacional
www.ufjf.br/mmc/