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BIOMATH

Department of Biomathematics Seminar Series:
Frontiers in Systems and Integrative Biology

Biological Regulation of Calcification and Field Theory for Inverse Problems

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23-105 Center for the Health Sciences (CHS)

ABSTRACT:

In this two-part talk, I will present a model for the regulation of precipitation of calcium phosphate species in biological tissues.

Calcium is an important ion for both structural support and biochemical signaling in vertebrates. As a result, it is necessarily maintained at high concentrations in fluids - at levels where precipitation is favored. Yet, such precipitation, when it occurs in an uncontrolled manner, is harmful. Using concepts from classical nucleation theory, I will discuss how biological organisms can regulate this high calcium concentration.

Nucleation and crystallization problems such as this one are often studied through the use of atomic force microscopy (AFM). AFM and related techniques are associated with inverse problems of Brownian motion. In the second part of my talk, I will discuss the inverse problem of potential energy reconstruction for random walkers under non-constant diffusivity. I will present a self-contained, nonparametric, regularized method based on Bayesian inference under which a path integral is used for uncertainty quantification. Under this method, regularization parameters are determined through optimization of an eigenvalue problem for a trace-class operator.

Host: Tom Chou, Ph.D.

To receive e-mail seminar notices, contact David Tomita (dtomita@biomath.ucla.edu)