

## **Stochastic and Multi-scale Dynamics of Stem Cells and Developmental Patterning**

**Qing Nie**

**Departments of Mathematics and Biomedical Engineering,  
University of California at Irvine, USA**

**Email of Presenting Author: [qnie@math.uci.edu](mailto:qnie@math.uci.edu)**

Noise and stochastic effect play important roles at all scales in complex biological systems. In this talk, I will discuss strategies and principles for noise attenuation and robustness to genetic and environmental perturbations in signal transduction, embryonic patterning, and regeneration driven by stem cells. In one case, I will introduce a critical quantity that dictates capability of attenuating temporal noise in feedback systems. In another case, I will show that noise in gene regulations actually enables reduction of stochastic effects in spatial patterns during embryonic development. Finally, novel experimental data that support our modeling and computational predictions will be presented and several multi-scale, stochastic, and computational modeling frameworks that are required for simulating such complex biological systems will be introduced.