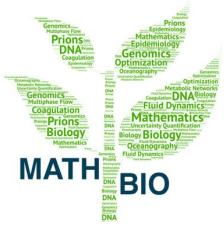
Mathematical Biology Seminar
Wednesday, March 10, 2021
Speaker: Dr. Sulimon Sattari, Hokkaido University,

Title: Do leader cells drive collective behavior in Dictyostelium Discoideum amoeba colonies?

Special Time: 4pm

Zoom Link: https://ucmerced.zoom.us/j/98050375649
Passcode: 172069

Abstract:
Dictyostelium Discoideum (DD) are a fascinating model organism. When nutrients are plentiful, the DD cells act as autonomous individuals foraging their local vicinity. After nutrients become depleted, they begin to starve and must aggregate so that they can spawn in a new area. At the onset of starvation, a few (<0.1%) cells begin communicating with others by emitting a spike in the chemoattractant protein cyclic-AMP. Nearby cells within a few hundred microns sense the chemical gradient and respond by moving toward it and emitting a cyclic-AMP spike of their own. Cyclic-AMP activity increases over time, and eventually a spiral wave emerges that can travel at the centimeter scale, attracting hundreds of thousands of cells to an aggregation center. How DD cells go from autonomous individuals to a collective entity remains an open question for more than 60 years. Recently, trans-scale imaging has allowed the ability to sense the cyclic-AMP activity at both cell and colony levels. Using both the images as well as toy simulation models, this research aims to clarify whether the activity at the colony level is in fact initiated by a few cells, which may be deemed "leader" or "pacemaker" cells. We begin by studying the meaning of leadership in collective behavior and use information-theoretic techniques to classify leaders and followers based on trajectory data, as well as to infer the domain of interaction of leader cells.



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