Modeling across the spectrum: how data, dynamics, and rules inform proactive models of living systems.

Computational models are essential tools that can be used to simultaneously explain and guide biological intuition. My lab employs machine learning, dynamical systems, and agent-based modeling strategies to help explain biological observations, and to uncover fundamental principles that drive both individual cellular decisions and cell populations. We are interested in the inherent multiscale nature of cells—how “the whole is greater than the sum of its parts”—and in predicting cell population dynamics from the composition of simpler biological modules to advance basic science and medicine.