

# KEYNOTE LECTURE

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## **How do zebrafish get their stripes – or spots?**

Many natural and social systems involve individual agents coming together to create group dynamics, whether the agents are drivers in a traffic jam, voters in an election, or locusts in a swarm. Self-organization also occurs at much smaller scales in biology, and here I will focus on elucidating how brightly colored cells interact to form skin patterns in fish. Because they are surprisingly similar to humans genetically, we will investigate zebrafish, which are named for their dark and light stripes. Mutant zebrafish, on the other hand, have variable skin patterns, including spots and labyrinth curves. All these patterns form as the fish grow due to the interactions of tens of thousands of pigment cells. This leads to the question: how do mutations change cell behavior to create spotted zebrafish? In this talk, we will combine different modeling approaches and topological data analysis to help shed light on this question. More broadly, we will explore how a combination of biological and mathematical approaches are being used to better understand how genes, cell behavior, and visible animal characteristics are related in fish.

