# Soft Living Active and Adaptive Matter

**Physics of *thinking* matter: birds, bugs, sheep, and plenty of fireflies**

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## Abstract:

How is it a physicist's business to study bird flocks and mosquito swarms? As it turns out, large groups of animals often display strong analogies with traditional physical systems, and notably emergent behavior when many individuals become strongly interconnected. They self-organize into specific patterns, reach equilibrium statistics, propagate waves, and display collective transitions reminiscent of phase transitions.

We will explore some of the recent advances in the field of animal collective behavior and ask how far traditional physics frameworks can extend to systems of active and cognitive entities, which I like to call "thinking matter". We will then focus on a spectacular and poetic manifestation of collective behavior: the spontaneous synchronization of thousands of firefly flashes.

**Date:**
02/27/2023

**Time:**
9:00 AM-10:15 AM (PT)

## About the speaker:

Raphael is a physicist, naturalist, and explorer with a broad curiosity for natural and cultural phenomena. Most of his research revolves around collecting and analyzing stochastic trajectories. From molecules crawling on a surface to migrating birds crossing continents, deciphering trajectories can reveal substantial information about an object (or subject) and its environment. His most recent pursuits investigate animal collective behavior, using spatiotemporal correlations in an ensemble of trajectories to understand how social interactions shape a group's collective dynamics.

Raphael's trajectory originated in Paris, France. He attended the Ecole Polytechnique and obtained his PhD at Yale University with Eric Dufresne. He then continued the westward course to Colorado, where he is now a postdoctoral associate at CU Boulder in Orit Peleg's lab.