# CoCo Seminar Series Spring 2026

## Complexity Science Crossing Oceans and Borders - Joint Academic Seminar of CoCo and COLIBRI

# Hysteretic Response in Excitable Honeybee Brood Waves

**Dr. Daniel Reisinger, Postdoctoral Researcher, Artificial Life Lab, University of Graz, Austria**

**Wednesday February 25, 2026 11:45 am - 12:15 pm EST**

**Fully online on Zoom (meeting link available on http://coco.binghamton.edu/)**

Honeybee colonies exhibit complex spatio-temporal brood dynamics modulated by collective thermal regulation. Observations from our experimental honeybee hives reveal recurring circular brood waves that emerge close to the comb's center and propagate outward with almost constant speed and frequency. Here we introduce a minimal reaction-diffusion model that couples excitable brood dynamics with local thermal regulation to formally understand the implications of these patterns for colony resilience. This abstracted model captures the observed brood wave patterns and allows fundamental inferences about the colony's stability. In particular, it demonstrates that brood dynamics undergo a gradual, second-order phase transition in response to changes in the local brood comb temperature, and an abrupt, first-order phase transition in response to changes in the external ambient temperature. These findings offer novel insights into the resilience and homeostatic self-regulation of honeybee colonies in response to temperature changes and enable the formulation of testable biological hypotheses for future experimental validation.

Daniel Reisinger is a Postdoctoral Researcher in the Artificial Life Lab at the University of Graz, Austria. He obtained his Ph.D. from the University of Graz, where he specialized in complexity science and computational modeling. His research interests include critical transitions, early warning signals, complex contagions, systems resilience, network topology, and swarm intelligence.

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