NIMBioS

National Institute for Mathematical and Biological Synthesis

cordially invites you to an

Interdisciplinary Seminar

with

Dr. Patrick Shipman

on

"Counterdiffusion in biological and atmospheric systems"

Tuesday, April 10, 2018
3:30-5 p.m.
Reception & refreshments at 3 p.m.

Hallam Auditorium, Room 206
1122 Volunteer Boulevard

Dr. Patrick Shipman is an associate professor of mathematics at Colorado State University. He earned a PhD in mathematics at The University of Arizona in 2008, applying the modern theory of pattern formation and ideas from number theory to understand how biochemical and biomechanical mechanisms interact to form patterns, such as Fibonacci spirals, on plants. He was an NSF postdoctoral fellow at the Max-Planck Institute for Mathematics in the Sciences, in Leipzig, Germany and at the University of Maryland-College Park. His current research interests include nanoscale pattern formation, topological data analysis, models of nucleation and growth, and conformal maps.

Abstract: In topochemically organized, nanoparticulate experimental systems, vapor diffuses and convects to form spatially defined reaction zones. In these zones, a complex sequence of catalyzed proton-transfer, nucleation, growth, aggregation, hydration, charging processes, and turbulence produce rings, tubes, spirals, pulsing crystals, oscillating fronts and patterns such as Liesegang rings. We call these beautiful 3-dimensional structures *microtornadoes*, *microstalagtites*, and *microhurricanes* and make progress towards understanding the mechanisms of their formation with the aid of mathematical models. This analysis carries over to the study of similar structures in protein crystallization experiments and the formation of periodic structures in plants.

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