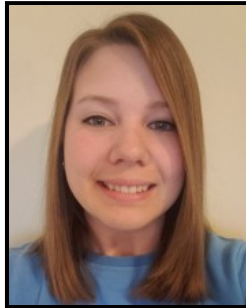




## Events

[Current Events](#)[Lectures ▾](#)[Events Archive ▾](#)

## Computational Mathematics Seminar Series

## Structure-Preserving Discretizations for Partial Differential Equations

Casey Cavanaugh, Louisiana State University

Postdoctoral Researcher

Digital Media Center 1034  
September 06, 2022 - 03:30 pm

## Abstract:

Models arising from partial differential equations (PDEs) often include physical laws such as conservation of energy or source-free flows, and theoretical properties such as the maximum principle. To accurately capture these types of features in numerical simulation, we consider structure-preserving discretization methods which guarantee that continuous level properties are satisfied exactly on the discrete level. This talk will focus on building connections between two known structure-preserving methods: the mimetic finite-difference (MFD) method, where discrete differential operators "mimic" their continuous level counterparts, and a mixed finite-element method (FEM) based on finite-element exterior calculus. First, we examine MFD discretizations for two PDE models: Maxwell's equations, describing the coupling between electric and magnetic fields, and convection-dominated diffusion equations, which are typically challenging to solve due to numerical oscillations from shocks and boundary layers. Then, by exploiting the connections between MFD and FEM, we demonstrate how a FE framework can provide the MFD method with supplementary theory such as well-posedness, stability, error estimates, and multigrid solvers.

## Speaker's Bio:

Casey Cavanaugh is a postdoctoral researcher at the Louisiana State University Center for Computation and Technology. She received her PhD and MS in mathematics from Tufts University, and BS in mathematics and BS in physics from Lehigh University. Her research focuses on scientific computing and numerical methods for partial differential equations (PDEs), specifically finite element methods, compatible discretizations, linear solvers, and multigrid methods. Cavanaugh was a winner of the Copper Mountain Conference on Multigrid Methods student paper competition, a recipient of the Tufts Math Department Distinguished Teaching Prize, and has previously worked as an intern at MathWorks.

