Cleveland State University
College of Science

COLLOQUIUM

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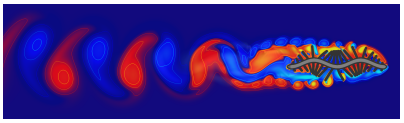
Wiggling and Paddling: Exploring Tomopteris Swimming Performance

Friday April 28th at 2:30pm in RT 1516



Bio: Nick did his undergraduate studies in math and physics as well as his masters in applied and computational math at RIT. He went on to earn a PhD in mathematics from the UNC Chapel Hill. During that time, he participated in a science policy program through the American Association for the Advancement of Science (AAAS), that focused on trying to ensure a safe, sustainable, and equitable clean water future. He is now an associate professor in Math and Stats at The College of New Jersey. At TCNJ, he works on numerous problems in biomechanics with his undergraduate research team.

Abstract: The soft-bodied, midwater polychaete Tomopteris is an interesting swimmer. Not only do Tomopteris swim continuously throughout their life, they also perform two modes of locomotion simultaneously: metachronal paddling and bodily undulation. Tomopteris have two rows of flexible legs (parapodia) positioned on opposite sides of its body. Although each row performs a metachronal beating pattern, they paddle out of phase to one another. Both of these paddling behaviors occur in concert with lateral bodily undulation. The undulation appears to further displace the parapodia, assisting the metachronal paddling process. We created a self-propelled, fluid-structure interaction model of a Tomopteris to explore how these two modes of locomotion synergize to generate effective swimming. In particular, we studied performance holistically over a 6D parameter space (leg length, leg number, paddling amplitude, undulation amplitude, body width, and fluid scale) with our sights on investigating higher-dimensional parameter spaces. In today's talk, I will describe how we approach studying Tomopteris swimming, through a blend of computational fluid dynamics and machine learning techniques.

Refreshments will be served in RT 1517 at 2:10pm