1145-92-1781 **Lucia Carichino*** (lcarichino@wpi.edu) and **Sarah D Olson**. *Emergent Three-Dimensional Sperm Motility Coupled to Calcium Dynamics.*

Sperm are navigating in a complex three-dimensional fluid environment in order to reach and to penetrate the egg. Changes in calcium concentration along the sperm flagellum regulate flagellar bend amplitude and beat asymmetry, enabling the sperm to achieve egg fertilization. However, the exact mechanisms of how calcium regulates the flagellar beat form are yet under investigation. We propose a fluid-structure interaction model that couples the three-dimensional motion of the flagellum in a Newtonian viscous fluid with the calcium dynamics in the flagellum. The flagellum is modeled as an elastic rod with preferred curvature and twist, using the Kirchhoff rod model. The calcium dynamics are represented as a one-dimensional reaction-diffusion model on the moving flagellum. The sperm motility and calcium dynamics are coupled assuming that the sperm flagellum preferred curvature depends on the local spatiotemporal evolving calcium concentration. The model is used to investigate the calcium coupling effect on the three-dimensional emergent waveforms and trajectories, compared to the two-dimensional case. Model results are in agreement with experiments, and show that three-dimensional trajectories can be characterized as hypotrochoid curves. (Received September 24, 2018)