Neuromechanical wave resonance in fluid pumping

Many biomechanical systems are activated by a nervous system that initiates and coordinates muscular contraction. In these systems, there are a number of intrinsic time scales, such as the speed and firing frequency of an action potential or the natural vibrational frequency of an elastic appendage or body. In this talk, we explore the dynamics that neuromuscular activation has in fluid pumping systems and use numerical simulations to describe the interplay between active muscle contraction, passive body elasticity, and fluid forces. This model is then used to explore the interplay between the speed of neuromechanical activation, fluid dynamics, and the material properties of systems, and we use it to describe a phenomenon known as neuromechanical wave resonance. The results from this have many potential applications to the actuation of soft-body robots and tissue-engineered pumps.