Title: Bistable dynamics of perceiving ambiguous stimuli

John Rinzel, Ph.D.

Professor, Center for Neural Science and Courant Institute of Mathematical Sciences

New York University, USA

Abstract: When experiencing an ambiguous sensory stimulus (e.g., the vase-faces image), subjects may report random alternations (time scale, seconds) between the possible interpretations. I will describe dynamical models with multiple time scales for neuronal populations that compete (fast time scale) through mutual inhibition for dominance - showing alternations (slow time scale). The models behave as noisy oscillators or as multistable systems subject to noise-driven switching. In highly idealized formulations networks are percept specific without direct representation of stimulus features. Our recent work involves perception of ambiguous auditory stimuli. The models explicitly incorporate sound features -- perceptual selectivity is emergent rather than built-in.

Short Biography: John Rinzel's research is in the biophysical mechanisms and theoretical foundations of dynamic neural computation. With a background in engineering (BS: Univ of Florida, 1967) and applied mathematics (PhD: Courant Institute, NYU, 1973) he uses mathematical models to understand how neurons and neural circuits generate and communicate with electrical and chemical signals for physiological function. John especially relishes developing reduced, but biophysically-based, models that capture a neural system's essence. Before joining New York University's faculty (jointly appointed in the Center for Neural Science and the Courant Institute of Mathematical Sciences) in 1997, he was in the Mathematical Research Branch at the NIH for nearly 25 years, most of that time as Branch Chief. John directs his group in computational modeling, electrophysiological and psychophysical experiments. John is a SIAM Fellow (2013); he received the Arthur T Winfree Prize (Society for Mathematical Biology, 2015). In 2019, he was awarded the Swartz Prize for Theoretical and Computational Neuroscience (Society for Neuroscience).