# Chen Institute Symposium 2025

**Speaker:** Steve Flavell

**Talk title:** *Neural sequences that drive sensory-guided reorientations in C. elegans*

**Abstract:** Complex behaviors like navigation rely on sequenced motor outputs that combine to generate effective movement. The brain-wide organization of the circuits that integrate sensory signals to select and execute appropriate motor sequences is not well understood. Here, we characterize the architecture of neural circuits that control *C. elegans* olfactory navigation. We identify error-correcting turns during navigation in odor gradients and use whole-brain calcium imaging and cell-specific perturbations to determine their neural underpinnings. These turns occur as motor sequences accompanied by neural sequences, in which defined neurons activate in a stereotyped order during each turn. Electrical synapses connect neurons that are temporally adjacent in the sequence. Moreover, distinct neurons in this sequence respond to sensory cues, bias upcoming turn directions, and drive movement, linking key features of this sensorimotor behavior across time. The neuromodulator tyramine coordinates these sequential brain dynamics. Our results illustrate how neuromodulation can act on a defined neural architecture to generate sequential patterns of activity that link sensory cues to motor actions.