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Multiscale dynamics of sensory processing

The senses must process a vast amount of environmental information and package it in a form that is accessible to a variety of target neurons. Main challenges for deciphering the principles of this coding and decoding are the presence of multiple scales of time and space and the influence of plasticity. One advantage of working at the sensory periphery is that one has a better intuition as to significance of the signals being processed at each stage, which can guide the analysis. This talk will present dynamical models for select combinations of space and time, inspired from experiments in electrosensory processing (a mix of the senses of touch and hearing). We will show two parallel schemes that enable the animal to simultaneously process high and low frequencies. One relies on “envelope” coding, and the other on synchronous afferent spikes—both nonlinear phenomena. We will also discuss how spatial correlations of stimuli interact with feedback in the sensory pathway to modulate oscillation strength.